COLUMBIA LIBRARIES OFFSITE
HEALTH SCIENCES STANDARD
HX64069648
RK57 In3
Dental science; ques
RECAP

RK57 In3
Columbia University
in the City of New York
School of Dental and Oral Surgery

Reference Library

Digitized by the Internet Archive
in 2010 with funding from
Open Knowledge Commons

http://www.archive.org/details/dentalscienceque00inge

G. Evans,
55 West 39th St
New York

DENTAL SCIENCE:

Questions and Answers,

ON

DENTAL MATERIA MEDICA,
DENTAL PHYSIOLOGY,
DENTAL PATHOLOGY AND
THERAPEUTICS;

BY

LUMAN C. INGERSOLL, A. M., D. D. S.
DEAN OF THE DENTAL DEPARTMENT OF
THE STATE UNIVERSITY OF
IOWA.

R. B. OGDEN & SON, PRINT KEOKUK.
1886.

RK57
In3

Entered according to Act of Congress, in the year Eighteen Hundred and Eighty-Six, by

L. C. INGERSOLL,

in the Office of the Librarian of Congress, at Washington, D. C.

DEDICATION.

TO MY

CO-ADJUTORS,

WHO HAVE GIVEN TO ME SUCH
GENEROUS AND AMPLE SUPPORT IN ALL MY WORK,

THIS VOLUME

IS MOST RESPECTFULLY INSCRIBED BY

THE AUTHOR.

CHAPTER I.

Dental Materia Medica.

CHAPTER II.

Dental Physiology

CHAPTER III.

Dental Pathology and Therapeutics

PREFACE.

The three Chapters of this Book are a compendium of the Lectures delivered by the Author in the Dental Department of the State University of Iowa.

As the Lectures were not intended to cover the ground of all our Dental Literature, the Compendium, of necessity, must come far short of it. The purpose has been simply to bring conspicuously into notice the fundamental facts and principles which underlie the practice of Dentistry. Having that in view, the Lectures were prepared from the stand-point of an office practice. In the Lectures I cracked many nuts; in the Compendium I have thrown away the shells and saved only the meats.

I have adopted the catechetical style as the most direct mode of fixing attention upon the facts and principles to be learned, and as the most concise mode of formulating instruction.

The blank pages will serve for taking notes of reading, or of information derived from other sources, on the same subjects as are made points of inquiry on the page opposite. Thus the work becomes a HAND BOOK OF READY REFERENCE for the Office.

My object in putting Materia Medica first, in the order of subjects treated, is, that it is more easily comprehended and learned by the large class of students who go to a Dental College with their minds out of training for the close and connected thought required in the study of Physiology and Pathology.

LUMAN C. INGERSOLL,

July, 1886. KEOKUK, IOWA.

CHAPTER I.

MATERIA MEDICA.

[MATERIA MEDICA broadly considered, is an embodiment of the History, Chemical Nature, Medicinal Properties and Therapeutical action of all substances used in modern days as medicines. The United States Dispensatory is designed to be such an embodiment. The use of Medicines should be reduced to the smallest number possible to secure the desired results. It is better to enter upon the practice of Dentistry with few medicines—such as have been tested by a long experience of the Dental Profession—than to try many new medicines with doubtful knowledge of their effects. Those here to be noticed are of the former class. New remedies should be experimented with only when the tried remedies either fail, are feebly effective, or are rendered objectionable by the idiosyncrasies of the patient.]

GEORGE EVANS,
49 West 39th St., N. Y. City.

Of what does Materia Medica treat?

Ans. Of the properties of those substances which are used as medicines.

How are medicines classified?

Ans. According to their effects.

Name the different classes in common use by dentists. Ans.

STIMULANTS;
TONICS;
SEDATIVES;
NARCOTICS;
REFRIGERANTS;
ASTRINGENTS;
STYPTICS;
CAUSTICS;
ESCHAROTICS;
ANTISEPTICS;
DISINFECTANTS;
LAXATIVES;
ANÆSTHETICS;

In what ways are medicines used?

Ans. Topically and generally.

What is understood by a topical, and what by a general use of medicines?

Ans. Medicines are used *topically*, when applied to a local and circumscribed part; and *generally*, when used to affect the whole system.

Which of the two methods is specially adapted to Dental practice?

Ans. The topical.

Are dental diseases local or general?

Ans. Usually local; but local affection may produce general disease.

In the latter case, which class of medicines should be used?

Ans. Local, usually; for, removing the local cause, will in most cases relieve the general system.

May general disease manifest itself locally in the Dental organs?

Ans. Yes.

Give an example.

Ans. Malarial disease manifesting itself in facial neuralgia.

What class of remedies is indicated in such a case?

Ans. Both general and local. Local, to relieve the local pain, and general, to remove the cause.

Is it wise for dentists to attempt to treat general disease?

Ans. It is not; the larger experience of the general practitioner enables him to be more successful.

STIMULANTS.

DEFINE.—Stimulants are medicines which excite functional action, especially, the action of the vascular and nervous systems.

Give the origin and primary signification of the word *stimulant*. Also its singular and plural forms.

Ans. It is derived from the latin word *stimulare*, to goad into action. Sing. *Stimulus*. Pl. *Stimuli*.

How are stimulants classified?

Ans. A two fold classification, viz:

1st. Vascular and nerve stimulants;

2nd. Diffusive, and persistent stimulants.

What is a diffusive stimulant?

Ans. A stimulant prompt in action, but temporary in its effects.

What is a persistent stimulant?

Ans. One that is lasting in its effects, though not always prompt in action.

What are the most common stimuli in use by dentists?

Ans. Capsicum, Oil of Cloves, Creasote, Heat and Cold, and the various vegetable oils.

Which of the stimuli named is both the most prompt and the most persistent?

Ans. Capsicum.

CAPSICUM.—Describe.

Ans. A yellowish-red vegetable powder—has a sharp, pungent, bitterish taste, with a sense of burning over the whole mouth.

What is its solubility?

Ans. Slightly soluble in water and vinegar; very soluble in alcohol and ether.

What preparations are usually found in the shops.

Ans. The *extract* and the *tincture*.

Why is Capsicum peculiarly adapted to local use?

Ans. Because it is prompt and persistent in action and will not vesicate, unless confined.

In what diseased conditions is it specially indicated?

Ans. In chronic inflammations, in indurations, in peridental inflammation, and in cases of incipient abscess.

In what combination is it used as a general pain obtundent?

Ans. In combination with Chloroform and Tinct. of Aconite, equal parts.

In such combination should it be applied externally, as a compress?

Ans. It should not, unless the object is to vesicate. It should be applied on a ball of cotton moved lightly over the affected part.

Oil of Cloves.—Give a description of this Oil.

Ans. It is an aromatic oil distilled from cloves; is very fluid, clear and colorless; becomes yellowish by exposure, and finally of a reddish brown color.

What are its common adulterations, and what the tests of its purity?

Ans. Adulterated with other essential oils. Its specific gravity being greater than that of water, when water is added the oil of cloves will be found at the bottom of the bottle, except when adultered with the oil of Cinnamon, which is also heavier than water.

What are the two most prominent and important elements contained in this oil?

Ans. An aromatic and pungent oil, and Tannin, in equal proportions.

What are its effects?

Ans. A prompt and active stimulant and astringent.

What is its use in dentistry?

Ans. To quiet the pain of an exposed pulp; peculiarly adapted to children's teeth, and all cases of demineralized dentine.

Is it antiseptic?

Ans. In small degree only; but having stimulating and astringent properties it is indicated in all cases of ulceration, superficial and deep seated.

Creasote.—Give a description of its appearance and properties?

Ans. Pure Creasote is a distillation from wood tar, of which it retains the odor; it is a nearly colorless oil; a stimulant prompt in action, creating a sharp stinging and burning sense in the mouth; promotes an active circulation in the parts with which it comes in contact; combined with Oil of Cloves, equal parts, it is one of the most valuable pain obtundents in use for cases of exposed pulp. [More fully treated of under the head of Antiseptics.]

Heat and Cold.—What is the effect on the tissues when heat is applied?

Ans. Heat expands the blood vessels and increases the circulation.

What is the effect of cold?

Ans. Cold contracts the vessels, and decreases the circulation; also decreases the heat of an inflamed part.

What is the effect of heat in cases of acute inflammation of a pulp?

Ans. Moderate heat increases the pain, intense heat relieves it.

What is the effect of cold on the same condition?

Ans. It increases the pain.

What is the effect of cold in a case of chronic inflammation?

Ans. It relieves it.

What is the special use of ice coldness?

Ans. Ice is used to prevent an alveolar abscess from pointing externally upon the face.

What is the best method of applying cold water for the relief of an aching tooth?

Ans. With a napkin, externally.

In cases of chronic inflammation of the root membrane, what is the best method of employing heat?

Ans. By a hot foot bath, and by the internal use of hot ginger tea or other stimulating tea.

In what way may you combine the effects of both heat and cold?

Ans. By using heat at the feet and cold water on the face.

How, and on what principle, may the stimulating effects of cold induce heat?

Ans. By using intense cold; the effect being to excite vital re-action.

Mention examples.

Ans. A glow of heat and perspiration, induced by a copious draught of cold water;

a redness and warmth of the fingers when playing with the bare hands in snow.

TINCT. OF IODINE.—How obtained?

Ans. Iodine is obtained from the ashes of sea-weed; is found in the shops in the form of flat purple-colored *crystals*, with a metalic lustre, and as a *tincture*.

How is it used in Dental practice?

Ans. To promote absorption of superfluous growths and swellings, and also to allay inflammation of the alveolo-dental membrane, and to arrest abscess.

Prep.—Tinct. 1 part, Iodine crystals, 12 parts by weight of alcohol.

Aqueous Solution.—½ oz. Iodide of Potassium, ¼ oz. Iodine, 3 oz. warm water. First dissolve the I. P.

Why are acqueous solutions preferable?

Ans. Because water is more readily absorbed by the gum than alcoholic preparations.

TONICS.—DEFINE.

Ans. Tonics are medicines which by *insensible degrees* give healthful activity and vigor to the functions.

To what class of medicines are the Tonics allied?

Ans. To the Stimulants.

What is the difference experimentally, between a Stimulant and a Tonic?

Ans. A stimulant produces a very prompt and *sensible* impression; a tonic produces an impression so mildly as to be scarcely *sensibly* felt.

How would you use a Stimulant to produce a tonic effect?

Ans. Reduce a stimulant until its effect is mild.

What other tonics may be used beside the mild stimulants?

Ans. Sulphate of Zinc, Tannin, Tea, Camphor.

SULPH. ZINC.—Describe.

Ans. It is a transparent, colorless salt, crystalizing in 4 sided prisms, and having a disagreeable metalic taste.

What is the character of the commercial article?

Ans. It is impure and should never be used medicinally; it is known as *white vitriol.*

What are the properties of Sulphate of Zinc?

Ans. It is tonic, astringent, and in its full strength, caustic.

Is it recommended in its caustic strength?

Ans. It is not, because of the pain which it produces.

What is the strength of the preparations recommended?

Ans. One to five grains to the ounce of water. It is insoluble in alcohol.

In what cases is Sulph. Zinc. specially indicated?

Ans. In cases of chronic ulceration, not of a malignant character; cases of debilitated function in a part.

What is its action in reducing inflammation?

Ans. By its astringency it contracts and depletes the blood vessels.

What is its use in diseased conditions of the gum and contiguous parts?

Ans. It is valuable in ulcerative conditions of the gum about the necks of the teeth and in peripyema.

What is the peculiarity of this preparation which renders it well adapted to be used on the gum?

Ans. Being an acqueous solution, it is more readily absorbed than alcoholic medicines.

TEA.—Is tea a vascular or a nerve tonic?

Ans. A nerve tonic.

What two varieties of tea are usually found in the market, and how are they distinguished?

Ans. Green and black; green tea has a leaf long and pointed, three times as long as it is broad; the leaf of black tea one-third shorter.

What are the elements contained in tea?

Periphyinna

Ans. A Volatile Oil, Tannic Acid, Theine, Albumen and a number of other elements of less importance.

To which of these elements does it owe its stimulating and tonic effects?

Ans. To its volatile oil and theine; especially the latter.

Which variety of tea possesses the most theine?

Ans. Green tea; contains from 2 to 4 per. cent of theine:

What is its taste?

Ans. Astringent, aromatic and cooling.

To what is its astringency due?

Ans. To the element of tannin.

What are its other properties?

Ans. It is an antifebrile, removing the feverish condition of the mouth. It is a deoderizer, and is in small degree antiseptic.

When is its use specially indicated?

Ans. After the extraction of teeth, to correct all disagreeable taste in the mouth, and to promote the healing of lacerated and inflamed gums.

How is it used?

Ans. In a decoction two or three times as strong as that prepared for the table, and used cold instead of hot.

CAMPHOR.—Describe.

Camphor is a white, tenacious and translucent gum, with a pungent, penetrating and fragrant odor; it is soluble in alcohol, acetic acid, chloroform and the fixed oils; alcohol forms a 75 per cent. solution.

What are its properties?

Ans. Sedative, tonic, and gives a sense of coolness.

What is its most direct action?

Ans. It acts primarily upon the nerves, and secondarily upon the vascular system.

NARCOTICS AND SEDATIVES.

What are Narcotics and Sedatives?

Ans. Medicines which allay irritability, relieve pain and promote sleep.

What is the chief of the Narcotics used locally?

Ans. The preparations of Opium.

OPIUM.—Describe.

Ans. A gum obtained from the poppy plant; a very poisonous drug, producing sleep and death. In small and diffused quantities it is used as a Sedative, acting upon the nervous system.

LAUDANUM.—What is it?

Ans. A tincture of opium.

Prep. 1¼ oz. opium to 1 pint of equal parts of alcohol and water.

What other preparation of opium is adapted to local use?

Ans. Wine of opium.

Prep.—2 oz. powdered opium, 75 grs. each of powdered cloves and powdered cinnamon, macerated in 1 pint Sherry wine for seven days, then filter.

How is it affected by age?

Ans. It loses its sedative effect, gradually.

Which of these preparations is preferable?

Ans. Wine of opium.

How is sedation produced?

Ans. In two ways; sedation may be produced *mechanically*, by removing the cause of irritation, as when air is excluded from an inflamed pulp, or it may be produced *functionally* by allaying the susceptibility of the nerves to the effect of an irritant.

May stimulants produce a sedative effect?

Ans. They may as a secondary effect.

What stimulants produce this secondary effect?

Ans. Alcohol, Chloroform, Creasote, Carbolic acid, Tinct. of Aconite.

TINCT. OF ACONITE.—What preparation is preferred?

Ans. That prepared from the root of the plant.

What is the effect of the drug when taken internally?

Ans. It is a powerful and active poison.

What is the effect applied externally?

Ans. Its first effect is stimulant, its secondary effect, sedative.

Name two preparations valuable as a liniment in neuralgic affections?

Ans. 1. Equal parts of Tinct. of Aconite and wine of Opium. 2. Equal parts Tinct. of Aconite, Alcohol and Chloroform.

Which of these is safest to be applied as a local anaesthetic in the mouth?

Ans. The latter.

REFRIGERANTS.

What are Refrigerants?

Ans. Medicines which reduce heat and give a cooling sensation.

What are those best adapted to dental use externally?

Ans. Ice and cold water; to the water may be added an equal quantity of alcohol or vinegar with cooling effect.

What may be used with good effect internally?

Ans. Chlorate of Potash, lemon juice diluted, and other mild acid drinks and acid fruits.

ASTRINGENTS.

What are Astringents?

Ans. Medicines which contract the tissues to which they are applied, and co-agulate albumenous substances.

What is the chief element in all vegetable astringents?

Ans. Tannin.

From what is tannin usually obtained?

Ans. Nutgalls.

Name the per cent. of tannin in the different vegetable substances in use as medicines.

Ans.	Nutgalls,	52 to 80 per cent.
	Kino,	57 "
	Catechu	32 to 50 "
	Oak Bark	11 "
	Black Tea	13 "
	Green Tea	16 "
	Blackberry Root	9 "

Describe the appearance of Tannin.

Ans. It is a very light, flaky powder, of a yellowish color.

What is its solubility?

Ans. It is soluble in water, alcohol and ether.

How is it best preserved?

Ans. In the powder; in solution it is liable to deteriorate. (See Styptics.)

STYPTICS.

What are Styptics?

Ans. Medicines which tend to arrest hemorrhage.

How is the arrest of hemorrhage accomplished?

Ans. In three ways. By co-agulating the blood at the mouths of the bleeding vessels,—by contracting the vessels,—and by compression, artificially.

What is the effect of the atmosphere on fresh blood?

Ans. It co-agulates it.

What is co-agulation of blood?

Ans. It is a thickening of the fibrin of the blood into a glutenous clot.

Is all blood alike co-aguable?

Ans. It is not.

Why?

Ans. All blood has not the same relative amount of fibrin.

Upon what class of medicines do we rely for the styptic effect?

Ans. Astringents; all the vegetable and mineral astringents.

Name the three in most common use by dentists.

Ans. Tannin, alum, per-sulphate of iron, and the concentrated extract of hamamelis.

How applied?

Ans. The first two should be used in the dry state, but may be used in solution.

Of the three styptics named, which is the most powerful?

Ans. Per-sulphate of Iron.

Describe it.

Ans. It is a reddish-brown, heavy powder, a powerful astringent and mild caustic.

Which is preferable for dental use, the powder, or Monsel's solution?

Ans. The powder.

What is the method of arresting severe hemorrhage occuring after extraction of teeth?

Ans. By the use of per-sulphate of Iron. Take a pellet of cotton or sponge, little larger than a pin's head, moisten with water and pass it into the open socket to the very bottom, holding it there for a moment to allow time for a firm coagulum to form, then gently remove the instrument.

What constitutional peculiarity indicates the use of compression?

Ans. The hemorrhagic diathesis. In case of such patients secondary hemorrhage is

liable to occur, when compression is indicated. Fill the socket loosely with cotton, covered with tannin or powdered alum, then form a pad of linen cloth, covering one surface with tannin, bring the jaws together upon the pad, and bandage over the head and under the chin.

CAUSTICS.—Define.

Ans. Caustics are medicines which create a sense of burning, and devitalize animal tissue superficially.

For what purpose are Caustics used?

Ans. Caustics are used in all cases of chronic ulceration, cases of superfluous growth, and in treatment of alveolar abscess.

For what direct purpose are caustics used in treatment of abscess?

Ans. To devitalize the abnormal tissue formed about the apical portion of a tooth root.

Name the caustics in most common use by dentists.

Ans. Carbolic Acid, Iodine, Chloroform, and Iodine combined with Creasote, equal parts.

ESCHAROTICS.—Define.

Ans. Escharotics are medicines that penetrate the surface, burning and devitalizing the tissue deep and producing an eschar.

How is the escharotic effect usually checked?

Ans. Its strength is lost by dilution in the tissues.

Why are escharotics so seldom used by dentists?

Ans. Because of the pain they produce, and the difficulty of arresting their action at the proper time.

How may a caustic be used with escharotic effect?

Ans. By repeated applications.

Which of the caustics named is preferable for this purpose?

Ans. Carbolic Acid.

Name a few escharotics in use by dentist.

Ans. Chloride of Zinc, Sulphate of Zinc, Potash, Arsenic.

ANTISEPTICS.—Define.

Ans. Medicines which prevent putrefaction.

What antiseptic substances are in common use for culinary purposes?

Ans. Salt, sugar, spices, vinegar, alcohol.

What drugs are in general use by dentists for their antiseptic effect?

Ans. Creasote, carbolic acid, phenol-sodique salicylic acid, iodoform, alcohol, eucalyptus oil. These are the chief.

Creasote and Carb. Acid.—How are they distinguished, the one from the other?

Ans. 1st. By the sources from which they are derived; the former being a distillation from wood tar, and the latter from coal tar. 2nd. By their chemical relations; *Creasote* being an oil, and *Carbolic Acid* an alcohol; *Creasote* being a liquid non-crystalizable, and *Carbolic Acid* always, in its pure state, crystalizable; *Creasote* is not soluble in water, and *Carbolic Acid* is readily soluble in 5 per cent. of water, and in any proportions by the addition of glycerine. 3d. By their difference of medicinal properties; pure wood Creasote is not a caustic; carbolic acid is a powerful caustic; *Creasote* is not a germicide; *Carbolic Acid* is a prompt germicide for most micro-organisms.

Phenol Sodique.—What is this drug.

Ans. It is formed by the action of caustic soda on impure carbolic acid.

What impurities are combined?

Ans. Cresylic and Picric Acids; both good antiseptics and not objectionable in the combination. It derives its name from *Phenol*, the name formerly given to crude carbolic acid.

What are its uses?

Ans. The same as Creasote.

Salicylic Acid.—Describe.

Ans. It is a white, light, feathery powder,

having a slightly sweetish taste, afterwards stinging.

What are its solvents?

Ans. Alcohol, ether, glycerine and hot water. Alcohol dissolves it freely; cold water sparingly. The alcoholic solution is an excellent dressing for root canals previous to filling.

Iodoform.—Describe.

Ans. It is in the form of small, pearly, yellow crystals. volatile and of a disagreeable odor, which may be disguised by combination with Oil of Cloves or Eucalyptus Oil or both.

How is it obtained?

Ans. It is a preparation of *Iodine* obtained from the alcoholic solution of Iodide of Potassa.

What are its solvents?

Ans. It is soluble in alcohol, chloroform, ether and the volatile oils, but insoluble in water.

What are its properties and uses?

Ans. It is stimulant, anæsthetic, tonic; a valuable antiseptic and sedative for suppurating surfaces; it is of the nature of a specific in treatment of teeth in which the pulps have died spontaneously; it promotes cicatrization; it is valuable combined with chloroform solution of gutta percha and the oxi-chloride of zinc for filling root canals; although it contains 75 per cent. of Iodine, it is non-irritant.

EUCALYPTUS OIL.—A distillation from the leaves of the Eucalyptus tree.

What are its properties?

Ans. It is an aromatic sedative and good antiseptic. Combined with Iodoform it is highly recommended in treatment of suppurating pulps and incipient abscess, also in treatment of caries of the alveolar processes, and in necrosis.

DISINFECTANTS AND GERMICIDES.—

DEFINE.

Ans. DISINFECTANTS are medicines which deodorize, nutralize and sterelize the products of decomposition and putrefaction.

GERMICIDES are medicines which destroy the micro-organisms concomitant with putrefactive decomposition.

Name those best known in dental practice

Ans. Carbolic Acid, Chloride of Zinc, Sulphate of Iron, Permanganate of Potassa, Peroxide of Hydrogen, Bi-chloride of Mercury, Aromatic Sulp. Acid.

CARBOLIC ACID.—Long considered the best disinfectant known; although active as a disinfectant, it is found that *all* the products and concomitants of putrefaction are not destroyed by it, which is probably true of every drug in use for disinfecting purposes. (See Antiseptics.)

Phagedenie

CHLORIDE OF ZINC.—Formed by the action of hydro-chloric acid on metalic zinc.

What are its properties?

Ans. Physically, it is a white, crystaline mass, readily deliquescent on exposure to the atmosphere, and wholly soluble in water, when pure. Medicinally, it is an escharotic, astringent and powerful disinfectant. Used as an escharotic it causes severe pain.

What are its uses in the mouth?

Ans. It is used in phagedenic ulceration of the gums, peripyema, caries of the alveolar process and necrosis.

Prep.—2 to 10 grains to the fluid ounce of water. It is also valuable in the roots of teeth where putrescent matter is found.

SULPHATE OF IRON.—*Copperas*; dissolved in twice its weight of cold water; or three-fourths its weight of hot water, is used to cleanse spittoons, slop pails and sinks.

PERMANGANATE OF POTASSA.—How obtained?

Ans. By the action of manganic acid upon caustic potash. It forms in long blue-black quadrangular or prysmatic crystals.

What is its solubility?

Ans. It is freely dissolved in water; it is used in solution of from 5 to 20 parts, by weight, to 100 of water. It is most conve-

nient to form a 20 per cent. solution as a standard of strength, then reduce as needed.

What are its properties ?

Ans. It is one of the most powerful disinfectants known; has extraordinary power in destroying fetid odor from organic sources, poisonous emanations from gangrenous ulcers, abscesses and wounds of all kinds. As an oxidizer it is not second to per-oxide of hydrogen. It is valuable in treatment of deep seated ulceration, caries of bone and necrosis.

PER-OXIDE OF HYDROGEN.—Of what does it consist ?

Ans. It consists of water with an additional equivalent of oxygen, united in the nascent state.

What are its properties ?

Ans. It is a powerful oxidizer, freely parting with its oxygen at the temperature of 60°, hence should be kept in close stoppered bottle in a cool place.

What restrains and what promotes its action?

Ans. Tobacco, aconite and other narcotic substances restrain its action, and contact with platinum or gold increases the activity with which its oxygen is liberated, hence it can be applied most effectively with a gold or platinum instrument.

Bi-chloride of Mercury.—*Corrosive Sublimate.*

What are its properties and uses?

Ans. It is stimulant, antiseptic, disinfectant and a powerful *germicide.* In a strong preparation it is a dangerous escharotic. It is used chiefly as a germicide.

What is the preparation for common use in ulceration and in treatment of peripyema (*pyorrhœa alveolaris?*)

Ans. 1 gr. Bichloride of Mercury and 40 drops of alcohol to 3 fluid ounces of water.

Aromatic Sulphuric Acid.—What are its properties?

Ans. In full strength it is mildly caustic and a good disinfectant, causing some pain. It is astringent, and in its milder solutions is stimulant and tonic.

What are its uses?

Ans. It is used in cases of peripyema, caries of bone, and necrosis; also in cases of mercurial sore mouth and salivation. For ordinary treatment it should be reduced 50 per cent.

LAXATIVES.

Give the effect of medicines of this class?

Ans. Laxatives are mild cathartics, acting upon the bowels to promote a more free discharge from the mucous lining of the intestines,

and to relieve costiveness by unloading the bowels, and increasing their peristaltic action.

How are laxatives employed in dental practice?

Ans. Both as medicines and diet.

What medicines are used?

Ans. The *saline cathartics*, such as solution of Citrate of Magnesia, Sulph. of Potassium, Cream of Tartar and Rochelle Salts.

What articles of diet are laxative in their effect?

Ans. Figs, Tamarinds, Cane Molasses, Cracked Wheat, Graham Bread. Oat Meal and all the small garden fruits.

ANÆSTHETICS.

What are Anæsthetics?

Ans. Medicines which destroy sensibility to touch and pain.

What is the difference between the caustic and anæsthetic effect in this particular?

Ans. Caustics render the tissues insensible by devitalization; an anæsthetic acts upon the nerves to render them insensible to the impression of an irritant.

What is a local anæsthetic?

Ans. A medicine that renders a circumscribed part insensible to pain.

What is a general anæsthetic?

Ans. A medicine that renders all parts of the body insensible?

Do local anæsthetics usually produce complete anæsthesia of a part?

Ans. They do not.

Mention the classes of medicines that furnish the local anæsthetics.

Ans. Stimulants, narcotics and sedatives.

Mention a valuable local anæsthetic

Ans. Aconite, alcohol and chloroform, equal parts.

Mention other local anæsthetics that are sometimes used.

Ans. Cold produced by ether spray, electricity, chloride of zinc, cocaine, tinct. of aconite root.

What is the danger of the ether spray?

Ans. Freezing the gum and consequent slough.

The objection to Chlo. Zinc.

Ans. Produces great pain and endangers the life of the pulp if applied to sensitive dentine?

Cocaine.—How obtained?

Ans. By distillation from the leaves of the cocoa plant.

What are its medicinal properties?

Ans. Tonic and anæsthetic. It is also a powerful poison.

What preparations of the drug are most used in dental practice?

Ans Oleate and citrate, 4 to 6 per cent. solutions.

How is general anæsthesia produced?

Ans. By an intoxicating drink, or by the inhalation of nitrous oxide gas, or the vapor of ether or chloroform.

What previous incidental circumstance tends to modify the effect of an anæsthetic agent?

Ans. The previous state of mind—fearful apprehensions, want of confidence in the drug, want of confidence in the operator.

What are the physical effects and progressive stages noticeable in the patient?

Ans. Stimulation, sedation, delirium, narcosis.

Is complete anæsthesia usually necessary for a brief operation?

Ans. No.

The sense of pain is of what two kinds?

Ans. Physical and mental.

Which is the most difficult to be overcome?

Ans. The mental sense.

How does this mental sense manifest itself?

Ans. In apprehension and dread of suffering.

In ordinary cases is anything more needed in using an anæsthetic than to overcome this dread and produce an indifference to pain?

Ans. There is not.

Is this a common effect of alcohol and other anæsthetics?

Ans. It is.

Nitrous Oxide.—What is it?

Ans. It is a gas obtained from nitrate of ammonia; the nitrate is placed in a glass retort and melted, when it becomes water and gas.

How is it used?

Ans. By inhalation.

Can it be condensed into a liquid?

Ans. It can be so condensed under very great pressure.

Is it perfectly safe and harmless?

Ans. No.

How is it, in this respect, compared with ether and chloroform?

Ans. It is the safest of the three.

Ether Sulphuric.—Describe it.

Ans. It is a colorless, volatile and inflammable liquid.

What different qualities of ether are sold in the shops?

Ans. Commercial, pure, and stronger or concentrated.

Which is used for inhalation?

Ans. The stronger.

How is ether obtained?

Ans. By distillation of alcohol with sulphuric acid.

CHLOROFORM.—What is it?

Ans. It is a colorless and volatile liquid, with a burning, aromatic and sweetish taste.

How is it obtained?

Ans. It is obtained from alcohol by distillation with chlorinated lime.

How does it compare with the other anæsthetics named?

Ans. It is the most powerful, most persistent and the most dangerous.

Upon what does the rapidity of its effects depend?

Ans. Upon the method of administering it and upon the susceptibility of the patient to its influence.

CHAPTER II.

PHYSIOLOGY.

[The Science of Physiology, in its widest significance, embraces the entire Anatomy and Physiology of plants, animals and man.

For convenience in study, each of these grand divisions is sub-divided into Anatomy and Physiology. Thus, we have Plant Physiology, Animal Physiology and Human Physiology. Anatomy and Physiology are separated on the life line.—Anatomy relating to the individual and distinct parts of the body, regardless of life and function; Physiology to the organism, living, acting and in full performance of function. Hence, Anatomy can be best studied on the cadaver, while Physiology requires experimentation on the living subject,

Again, for purposes of special study and the more thorough application of the Science to the practical service of mankind, each sub-division is classified into systems of organs related to each other in the performance of a distinct function. Dental Physiology is one of these latter classes or divisions, and pertains to the Dental Organs, embracing their origin and embryonic condition; their nutrition and developmental changes of form and structure; their arrangement in the jaws; their relations to contiguous parts, and their functions and special use as regards the entire physical economy of the body.

As a branch of study in a College, even this limited amount of physiological lore is found to be too much to be embraced in this course of Lectures. Hence, I have omitted the Nervous, Vascular and Lymphatic Systems in their relations to the Dental Organs, also Nutrition and Hygiene, trusting to the Lectures on General Physiology to supply this lack. It will be readily seen that their relations to the Dental Organs and associate parts are the same as their relations to other Organs and parts of the body, modified only by peculiarities of their anatomical structure.]

DEFINITIONS.

Define the words, structure, organic, inorganic, function, tissue.

Ans. STRUCTURE;—Matter arranged in definite form.

ORGANIC;—Possessed of such structural forms and forces as adapt an organized body to the spontaneous performance of function.

INORGANIC;—Such bodies as have no such definite organization of parts, and perform no functions.

FUNCTIONS;—The activities or service which an organism is adapted to perform.

TISSUE;—A name applied to all the different forms and parts of organized structure considered separately.

What does PHYSIOLOGY teach?

Ans. It teaches the development, structure, functions and laws that govern organized bodies.

On what peculiar phenomena are the teachings of physiology based?

Ans. On the phenomena of life and function.

What is the difference betwen Anatomy and Physiology?

Ans. The former pertains to organized bodies in a state of rest and inaction; the latter to the same bodies in a state of functional activity.

What is that force called which produces functional activity?

Ans. Life-force.

Give two definitions of life?

Ans. 1st, The term life, expresses the difference between an organized body capable of motion *from a source within itself*, and the same organism *incapable* of motion *from a source within itself*. 2nd, That force in organized bodies which resists the tendency to chemical decomposition.

How do you prove the existence of such a force in organized bodies?

Ans. By its effects.

What is the most common and appreciable exhibition of the life-force?

Ans. Motion, without the application of any *external force*.

What is the theory of the objectors, concerning motion as a manifestation of the life-force?

Ans. That motion is an inherent property of matter.

What antagonistic theory is also held?

Ans. That inertia—a perpetual—rest, is an inherent property of matter.

How may these opposing theories be reconciled?

Ans. Atoms of matter may be in motion relatively to each other, while, combined into molecules or larger bodies, the combined mass may be at perfect rest.

What are the forces acting to produce motion in matter?

Ans. Chemical, electrical and vital.

What is the minutest portion of vitalized matter called?

Ans. A cell, ameba, etc.

Give a definition of a cell?

Ans. The minutest portion of matter capable of the manifestation of life.

What is the difference between the animal and the vegitable cell?

Ans. There is no known difference.

Describe the cell as ordinarily found in organized tissue.

Ans. It consists of an outer filmy covering, called the *cell wall*, a semi-fluid, albuminous mass within, called *protoplasm*, and a more solid mass floating in the semi-fluid called a *nucleus*.

What familiar example have we of this kind of structure?

Ans. An egg, deprived of its shell.

Give its corresponding parts.

Ans. The skin of the egg beneath the shell, represents the cell wall; the albuminous portion represents the protoplasm, and the yolk, the nucleus.

Are these three parts considered essential to the existence of a cell?

Ans. Embryonic cells have no cell-wall and no nucleus.

How is the cell-wall formed?

Ans. Of the waste matter thrown to the surface from within.

What may be said of the independence of the cell?

Ans. Each individual cell is an independent organism.

How does the cell derive its existence?

Ans. From the parent cell,—every cell from a pre-existing cell.

How are cells propagated?

Ans. Usually by division, or by budding.

What may be said of the functions of the cell?

Ans. All functional activity, nutrition and disease, are referred to the cell elements of the different organs.

THE DENTAL FOLLICLE.

In what tissue of the body have the teeth their origin?

Ans. In the mucous membrane.

Locate the mucous membrane.

Ans. It is the lining membrane of the oral cavity and covers the internal organs and portions of the body; it is a continuation through the mouth, of the external skin.

What general term is applied to this covering of the body, both external and internal?

Ans. Derma.

What other growths beside the teeth are peculiar to the derma?

Ans. Hair and nails.

What is understood in dental science as the process of *teething*?

Ans. It includes all the processes of tooth formation from the development of the germs of the first set of teeth to the completion of the second denture in adult life.

Of what three principal layers or parts does the mucous membrane consist?

Ans. The dermis, the epidermis, and the basement membrane lying between.

Describe each.

Ans. The *dermis* is the internal portion and is made up of connective tissue, blood-vessel, nerves and cells.

The *epidermis* is the external portion of the membrane and is composed of layers of cells of different forms.

The *basement membrane* is a structureless film lying between the epidermis and the dermis.

Name the different cells found in the epidermis?

Ans. Columnar or prismatic, spinous, hexagonal or pavement, flattened, epithelial scales.

In what part of the epidermis are the columnar cells found?

Ans. In the inner portion and resting on the basement membrane.

Where are found the epithelial scales, and what are they?

Ans. Found on the external surface, and are considered to be the worn out and dead cells.

Which are considered the embryonic cells?

Ans. The columnar layer.

Have they a cell wall?

Ans. They have not.

Have they a nucleus?

Ans. Not in their embryonic condition.

What other contiguous structure undergoes the process of development simultaneously with the teeth?

Ans. The maxillary bone.

Does it come first into existence as a hard, mineralized tissue?

Ans. A cartilage is first formed, called MECKELS CARTILAGE.

At what time and in what manner does it make its appearance in the human embryo?

Ans.* From the 15th to the 18th day of intra-uterine life; when the embryo appears but a gellatinous mass about one half inch in length, two faint and indistinct tongue-like processes may be seen which in a few days approach each other, swinging around into the form of a semi-circle. At about the 28th day, these semicircular processes become united. By the end of the first month the appearance is that of a glistening cartilaginous band. At the end of the second month the band has been condensed into a hard cord of about the size and appearance of a hog's bristle, at which time the embryo has attained the length of little more than three fourths of an inch and Meckel's cartilage about one fourth of an inch across its circular extremities.

On what line do these first formed processes unite?

Ans. On the medium line.

*The formation of Meckel's cartilage and the dental follicles as here presented, follows mainly the teaching of Legros and Magitot.

Where are the terminal extremities of Meckels cartilage found?

Ans. In the *malleus* of the ear on either side.

What purpose does this cartilage serve?

Ans. It serves as a temporary support for the soft tissues and cell elements of the tooth germs.

When does it disappear?

Ans. Usually with the development of the osseous structure of the jaw; sometimes, not until after birth.

What is the first appearance and in what layer of cells is found the beginning of tooth formations?

Ans. In the line of columnar cells, which forms a deflection downward into the dermal tissue, carrying the basement membrane with it.

At what period is this first development?

Ans. At the beginning of 2nd month.

What is the *epithetial band* and how is it produced?

Ans. It is the deflected portion of the epidermis, with the ridge above it, formed by the rapid prolification* of cells in the deflected portion and the crowding out of the older and worn out cells.

*This term is derived from two latin words; *proles*, offspring, and *facere*, to make, to generate, to produce. The word "*proliferation*" very commonly used in the same sense, is derived from the words *proles* and *fere*, to bear, in the sense of to carry; and only in its secondary sense does it signify to produce or generate. I consider, therefore, *prolification* the better word.

What cells are found in the deflected portion of the epidermis?

Ans. The columnar cells in continuous line, and hexagonal cells in the intervening space.

What is the next development of the prismatic layer?

Ans. The formation of another fold from the inner or lingual side of the first fold, and projecting horizontally,—called a *lamina*.

What is the third development?

Ans. A line of tubercles appear at intervals along the margin of the lamina, corresponding in number to the future teeth of the first set.

What form do they assume?

Ans. They increase in length, turning downward, with a rounded extremity and neck, in bottle form.

What is this pendent portion of the membrane called?

Ans. The enamel organ.

Describe the first appearance in the development of the dentine organ?

Ans A papilla arises in the dermal tissue at a point immediately in contact with the rounded portion of the enamel organ, and simultaneously the bottom of the bottle-like form is rendered concave in exact correspondence to the form and size of the dentine papilla rising from the dermis.

What change is next seen in the enamel organ?

Ans. The change of the hexagonal cells into the stellate or star-shaped form. Their processes, inosculating, form a reticulum or net work.

What change takes place in the columnar cells?

Ans. The ends resting on the basement membrane are crowded into the hexagonal form, while their other extremities form into points and delicate processes, and unite with the processes of the stellate cells in the enclosure of the enamel organ.

What is now the position of the basement membrane relative to these two forming organs?

Ans. It lies between and separates them.

What are the cells employed in the formation of enamel called?

Ans. *Ameloblasts.*

What are the working cells of the dentine organ called?

Ans. Odontoblasts.

What is the name of the cells employed in the formation of bone?

Ans. Osteoblasts.

At what time does the dentine bulb begin to assume the tooth form?

Ans. At about the 9th week of embryo life.

What tissue is next developed at the base of the dentine bulb?

Ans. The follicular wall, proceeding upward and surrounding the enamel and the dentine organs.

What third organ is formed to complete the group of the dental tissue?

Ans. The formative organ of the cementum.

Where does it originate?

Ans. At the base of the dentine bulb, between the follicular wall and the enclosed contents?

Do any other organs have their origin here?

Ans. It is not probable that any other organs or functions are developed within the dental follicles, except those concerned in the formation of the dental tissues.

Give the number and names of the dental tissues as indicated by the presence of their formative organs in the dental follicle.

Ans. Five, viz: *Enamel*, *dentine*, *dental pulp*, *cementum* and *peri-dental membrane*.

At what time are the follicles of the first set of teeth completed?

Ans. By the end of the 12th week.

When the follicle is completed what change takes place?

It is sundered from the epithelial band by absorption of its neck at about the 16th week.

How early do the follicles of the permanent teeth begin their development?

Ans. As early as the 15th or 16th week of embryo life.

Which of the follicles of the permanent teeth is first, in point of development?

Ans. The follicle of the first molar.

How soon is this succeeded by the follicles of the teeth anterior to it?

Ans. In about a week.

Where do they originate?

Ans. Either from the necks of the primitive follicles, or from the epithelial lamina.

At what time does the budding from the primitive cord take place?

Ans. Before the follicle is sundered from the epithelial lamina.

Where originates the bud of the follicle of the first permanent molar?

Ans. From the epithelial lamina, back of all the follicles of the temporary set.

What is the course of the follicles of the anterior permanent teeth, relative to the positions of the primitive follicles?

Ans. They fall back of and below them.

What is peculiar in the form of the cord of the permanent teerh to distinguish it from that of the temporary?

Ans. It is longer and in spiral form.

Which is first in the order of development, the follicle of the first permanent molar or the follicles of the permanent incisors?

Ans. The first permanent molar—about a week previous to the incisor follicles.

Where, according to Legros and Magitot, originates the follicle of the 12th year molar?

Ans. From the neck of the follicle of the 1st molar.

At what period of time does it begin to form?

Ans, At about the 4th month after birth.

At what period of time does the follicle of the 3rd permanent molar begin its development?

Ans. At about the 3rd year after birth, budding from the neck of the follicle of the second molar.

How long a time is it in its follicular evolution?

Ans. About 3 years.

At what age of the child does this follicle lose its connection with the epithelial band?

Ans. At about the 6th year of age.

How long a time is this tooth in coming to such maturity as to emerge from the gum?

Ans. Twelve or more years.

Is this theory of Legros and Magitot, which derives the permanent teeth from the necks of the follicles of the temporary teeth, accepted by all authors?

Ans. It is not; it is believed by some that all the teeth of the permanent set originate from the epithelial lamina the same as the temporary follicles.

Development of the Maxillary, Bones and Mineralization of the Teeth.

What is the relation of the bone structure to other parts and tissues of the body?

Ans. Bones give general form to the body, and are the frame work supporting the soft tissues through which the various bodily functions act.

What may be said of the maxillary bones and of the teeth in this regard?

Ans. The maxillary bones help to give form to the face, and are subservient to the organs of mastication. The teeth are parts of the organic structures employed in mastication.

What direct and special purpose do the maxillary bones serve?

Ans. They support the teeth in a fixed position.

What is the development of bone tissue called?

Ans. Ossification.

Define ossification.

Ans. It consists of a deposit of calcareous matter within the inter-spaces of cellular tissue.

What class of cells accomplish this?

Ans. The osteoblasts.

Does the process of ossification progress in all parts of a bone at the same time?

Ans. It begins at one, two or more points remote from each other, called centers of ossification.

How is continuity of the structure formed?

Ans. By a fusion of the radiating points from these centers of ossification.

What is the economic reason for this method of development?

Ans. If the entire bone structure were in process of ossification at the same time, the nutritive system would be inadequate to supply the requisite amount of lime salts.

From how many centers does the lower maxilla begin its ossification, and where located?

Ans. With two centers, located one in each lateral half of the jaw and on the line of Meckel's cartilage.

How many centers of ossification are first noticed in the upper maxilla?

Ans. Five centers.

What is the cause of cleft palate?

Ans. A failure in the union of the right and left halves of the palate processes of the upper maxilla, or of their union with the inter-maxillary bones.

Where are located the inter-maxillary bones?

Ans. They form the anterior portion of the palate process.

Where is the line of union with the palate process?

Ans. Between the cuspids and lateral incisor teeth.

What teeth are developed in the inter-maxillary bones?

Ans. The incisors.

Explain the formation of double cleft palate and hare-lip.

Ans. The inter-maxillary bones may fail to unite with the palate process on one side or the other, or on both sides; or the inter-maxillary bones may be entirely wanting, and a double cleft be the result.

How is the groove formed in which the dental follicles are formed?

Ans. By the ossification of the external and internal plates of the jaw and their union at the basilar portion.

At what time and in what manner are the alveoli formed?

Ans. At about the fourth month of fœtal life cartilaginous processes project from the opposite sides of the maxillary groove, which unite and become ossified, thus forming the transverse septa of bone that separate the alveoli from each other.

What is the difference in the degree of advancement of the different follicles?

Ans. At this period there is no perceptible difference.

MINERALIZATION.

In what part of the tooth structure does mineralization begin first?

Ans. In the dentine bulb, and in that part of the bulb that forms the cutting edges of the incisors and the cusps of the other teeth.

What is the arrangement of the odontoblast cells for the process of dentinification?

Ans. The larger cells are arranged along the periphera of the pulp and are called the odontoblast layer.

Explain how it is that the tubular structure of dentine is formed?

Ans. The odontoblast cells throw out processes from the external extremities, and around the processes the lime salts are deposited, the process lengthening with the thickening of the cap of dentine. Thus, if at any time the pulp

and these processes be withdrawn from the forming dentine, the dentine cap would present perforations equal in number to the processes, and running entirely through it to the line of contact with the enamel organ.

What are the processes occupying the tubules of the dentine called?

Ans. Dentinal fibrilli.

As age advances, what change takes place in the fibrilli and the tubules?

Ans. Both the tubules and the fibrilli decrease in size, becoming very small in middle life, and in old age, the extremities are found wholly obliterated.

What then is the tendency of the pulp from childhood to old age?

Ans. It tends to obliteration.

Does it become wholly obliterated by a physiological process?

Ans. It does not usually, but becomes dormant after the maturity of the tooth structure.

May it become stimulated into activity again, and how?

Ans. It may be stimulated to take on formative action by abrasion of the tooth crown or by disease.

When a thin cap of dentine has been formed, what change takes place in the enamel organ?

Ans. The peripheral cells lying in immediate contact with the cap of dentine become elongated to two or three times their original length and send out from their inner extremities long processes to inosculate with like processes of the stellate cells in the central portion of the organ.

As they are compacted together, what form do they take?

Ans. The hexagonal form, at their bases, while the extremities toward the interior of the enamel organ are pointed.

Have these cells any cell wall?

Ans. They have not.

Explain the process of formation of enamel rods or prisms.

Ans. The lime salts are first deposited at the base in contact with the cap of dentine, each enamel rod taking the exact form of the cell, which by compact becomes hexagonal, and the lime salts from each cell (there being no cell wall) are deposited in immediate contact with the lime salts deposited from each contiguous cell.

In what form is the lime thus deposited?

Ans. In solution, to harden by crystalization.

What becomes of the cell as the lime deposit increases?

Ans. It becomes less and less in substance, till what remains is atrophied in the central portion of the enamel rod.

In a fracture of the enamel where is the line of cleavage, and why?

Ans. Along the central portion of the rods; because this portion being formed by the cell while wasting its strength and substance is weaker and in this portion of the enamel rods is found the larger portion of what remains of the animal or organic tissue.

What is understood by the internal epithelium and what by the external epithelium?

Ans. The line of columnar cells in immediate contact with the formed dentine is called the *internal epithelium* and the remaining peripheral cells of the enamel organ are called the *external epithelium*.

What becomes of the external epithelium?

Ans. The cells atrophy and remain upon the surface of the formed enamel, as a kind of "cuticle of the enamel" presumed to be "Nasmyth's membrane."

What other organs are developed or modified contemporaneously with the teeth?

Ans. The stomach and the intestinal canal.

What change takes place in the stomach?

Ans. It is changed from a mere tube as found in the infant, to the the pouch-like form.

How is this change brought about?

Ans. By a development of the lower curvature of the stomach to two or three times the length of the upper curvature.

Why is this change necessary?

Ans. The development of teeth is an indication of a need of solid food, and the enlargement of the stomach to the pouch-like form is for the purpose of detaining such food for the process of digestion.

EMERGENCE OF THE TEETH.*

Deciduous Teeth.

In what stage of development are the teeth when prepared to emerge?

Ans. The crowns are formed.

Which teeth of the first set are earliest in cutting the gum?

Ans. The lower central incisors.

At what age of the infant do these teeth begin to emerge?

Ans. At from 5 to 8 months of age.

Which are the last teeth to emerge and at what age?

Ans. The cuspids; from 30 to 32 months of age.

*The word "eruption" commonly used in this connection is a disgusting word, applied to loathsome forms of disease, and has no place in Physiology. One might as well speak of an *eruption* of corn, or of a hill of potatoes *erupting*, as to speak of the *eruption* of the teeth.

At what age does the infant get its masticating teeth?

Ans. At the age of 24 to 30 months.

What does the development of the teeth indicate as to the diet of the child?

Ans. That solid food should not be given to a child until its masticating teeth have fully emerged.

What may result from taking solid food before the masticating teeth have emerged?

Ans. Cramps, spasms, fits and other signs of indigestion.

To what cause are such symptoms often attributed?

Ans. To the process of "teething."

Is "*teething*" a physiological or a pathological process?

Ans. It is a physiological process.

Is it proper in tables of mortality to attribute the death of infants to "teething?"

Ans. Death should not be attributed to a physiological cause.

To what should such deaths be ascribed?

Ans. To some attending pathological condition.

What is the force which causes the teeth to emerge?

Ans. Vital force.

How does it operate ?

Ans. By growth; developing first the neck, then the remaining portion of the root.

What resistance is offered to the emergence of the teeth ?

Ans. 1st. The follicular wall; 2d. The bone forming a cap over the alveoli; 3d. The dense fibrous tissue forming the gum; 4th. The mucous membrane.

By what process is this resistance overcome ?

Ans. By absorption of the overlying tissues.

Suppose the absorption does not progress as rapidly as the growth of the advancing tooth, what will be the result ?

Ans. Pain more or less intense, sometimes causing spasms.

What is the chief cause of the pain?

Ans. The resistance offered causes a re-actionary force downward upon the pulp.

How is this pain relieved ?

Ans. By friction and pressure upon the gums to induce more rapid absorption, and in cases of intense pain or general disturbance of the system, by lancing the gum.

What is the theory concerning the exciting cause of absorption ?

Ans. That the pressure of the advancing tooth induces absorption of the overlying tissues.

What would be the result if mere mechanical pressure induced absorption?

Ans. The pressure of the different organs of the body upon each other would induce their absorption—thus the body would become self-destructive.

What should be the statement of the pressure theory of absorption?

Ans. *The pressure of a foreign body induces absorption.*

After the emargination of the alveoli to allow the crowns to pass through, what change takes place regarding the alveolar bone?

Ans. Absorption ceases and there is a renewal of bone-formation at the margins of the alveoli, to embrace the neck of the forming tooth.

When the crowns have fully appeared how far advanced in mineralization are the roots?

Ans. They have attained about half their length.

PERMANENT TEETH.

In a harmonious development of the teeth and jaws, what are the indications of the time approaching for the development of the permanent teeth?

Ans. The expanding of the alveolar ridge, and the spreading apart of the deciduous teeth.

If the teeth do not spread what does this indicate as to the future development?

Ans. A contracted jaw, crowding and displacement of the permanent teeth.

Which is the first of the permanent teeth to appear? Where? At what age?

Ans. The first inferior molars;—back of all the temporary teeth;—at about the sixth year of age.

Which teeth emerge next, and at what age?

Ans. The lower central incisors, at about seven years of age.

What class of teeth take the places of the deciduous molars?

Ans. The bi-cuspids.

At what age do they appear?

Ans. At from nine to ten years of age.

What position do they occupy in the jaw before their emergence?

Ans. The crowns of the bi-cuspids are located between the roots of the deciduous molars.

By what process are the temporary teeth removed to give place to the permanent teeth?

Ans. By absorption of their roots.

Suppose that, on the pressure theory of absorption, the advancing crown of the permanent tooth impinges upon the root of the temporary tooth, what is the result?

Ans. The absorption of the root ceases at the point of pressure.

How is the process of absorption of the roots of teeth accomplished?

Ans. The absorbing organ exudes a solvent.

What is the supposed origin of the absorbent organ?

Ans. Some suppose it to be a modification of the cementoblasts of the root membrane. Others that the tooth pulp having ceased its work of tooth formation, becomes an organ of absorption to take down the work of its own formation.

What evidence is there that the pulp exercises a controlling influence in the work of removal of the roots of the temporary teeth?

Ans. The fact that when the pulp dies the work of absorption ceases as a *physiological* process, and afterward progresses only *pathologically*.

What are John Tome's theory and observations concerning the absorbent cells?

Ans. That the work of absorption of the roots of teeth is accomplished by a class of cells called "giant cells," which he describes as clusters of cells.

Functions and uses of Dentine, Enamel, Cementum, Alveolo-Dental Membrane, and of the Teeth and Jaws.

DENTINE.

Which of the tooth tissues gives form to the tooth?

Ans. The dentine. Remove all the other tooth tissues and the dentine remaining shows the typical form of the tooth.

What are its chief characteristics which adapt it to constitute the main body of the tooth structure?

Ans. Its density, its elasticity and its vitality.

Define elasticity.

Ans. That property of any substance which causes it to recover its form when stretched, bent, or indented.

What is the advantage of this property in the dentine of teeth?

Ans. It prevents breaking the structure under the force of mastication.

Why does not dentine meet all the requirements of a hard tissue in tooth formation?

Ans. It is not sufficiently dense to resist abrasion.

ENAMEL.

What of enamel as to its density?

Ans. It is the most dense and the hardest of all organized substances.

What uses does the enamel serve?

Ans. Primarily, its use is to protect the dentine from abrasion. Secondarily, to protect it from decay, and thirdly, to beautify the teeth.

What evidence is there that protection from decay is not the primary use of enamel?

Ans. 1st. In nearly every mouth teeth *do decay*.

2d. Enamel and dentine are composed chiefly of the same element,—lime.

3d. Teeth with the enamel worn off from use, remain for years without decay.

4th. Teeth ground or filed in a dental operation so as to expose the dentine, do not, for that reason, necessarily decay.

What are the conditions of exposed dentine which serve to protect it against decay?

Ans. Smoothness and cleanliness of the surface.

DENTAL PULP.

What is the chief function of the dental pulp?

Ans. It is the formative organ of the dentine.

Has it any other function ?

Ans. It is an organ of nutrition as regards its own substance, and, for a limited time after birth, it nourishes the dentine.

Is there any evidence that the nutritive function pertains to the hard substance of the tooth after the maturity of the tooth structure ?

Ans. There is not.

What are some of the facts and arguments in support of this theory.

Ans. 1st. Teeth are different from every other structure, so that the laws governing other structures are not applicable to them.

2d. The hard tooth tissues are not wasted by physiological processes like other tissues of the body, hence do not need the same renewal.

3d. In their nature they are more permanent than any other organic structure. They resist decay on exposure to external influences, for hundreds of years after all other tissues of the body are dissolved.

4th. Bones may be destroyed by disease or by a surgical operation, and nutrition will restore the lost part under favorable circumstances; but no lost part of a tooth is ever restored by nutrition under any circumstances.

What may be said of the pulp as a necessity in mature teeth ?

After a requisite number of years in maturing the tooth structure the pulp is not essential to the integrity of the other tooth tissues.

In what condition is the pulp after completing its work as a formative organ ?

Ans. In a dormant condition.

Under what circumstances is it again excited into action?

Ans. By abrasion, or by decay causing irritation.

Is this secondary formation, known as secondary dentine, identical with the first formation ?

Ans. It is not. It is less dense and less regular in its structure.

Name analogous cases of other organs completing their organic work and becoming dormant.

Ans. The root membrane ceases its formative work of depositing cementum, and exists only as an organ of nutrition. The genital organs become dormant late in life and do not renew their vigor.

CEMENTUM.

What is the special use of cementum?

Ans. Being intermediate in the density of its structure it serves to form a union of the soft tissue of the root-membrane with the den-

tine, thus preserving the vitality of the tooth after the death of the pulp.

What two functions has the alveolo-dental membrane?

Ans. It is the formative organ of the cementum, and also the formative organ of the parietes of the alveoli.

What does this double function indicate as to its structure?

Ans. That it exists as a double membrane.

What conflicting teaching of authorities points to the same conclusion?

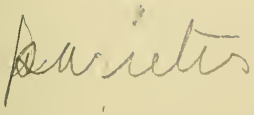
Ans. That the root membrane is a continuation of the periosteum of the alveolar ridge; and again, that it originates in the dental follicle. It cannot originate from these two different sources except it be a double membrane.

Are the two layers or parts of this membrane seperable, and by what means?

Ans. They are separated in the extraction of teeth. A membrane is found on the extracted root, and also a membrane found lining the socket.

What would be the result if the alveolar wall was denuded of its periosteum when a tooth is extracted?

Ans. Necrosis of the bone which constitutes the socket.



What evidence is found in the structure of the two parts or membranes?

Ans. They are not of the same structure.

Is there any evidence to prove, that the fibres composing the membrane next the cementum connect and become continuous with the net work in the part next to the bone?

Ans. As it is claimed to be only an "insensible" union, there is no proof of continuity of tissue.

What evidence of duality of the membrane is found in the nerve and vascular supplies?

Ans. The nerve and vascular supplies are from two sources; from the nerves and vessels that supply the periosteum of the alveolar ridge and the gum, on the one hand, and from the nerves and vessels that supply the pulp, on the other hand.

What evidence is found in the pathological conditions of the membrane?

Ans. In diseased conditions arising from peridental irritation it deposits cementum on the root, but no osseous formation on the wall of the socket opposite; showing that the nutrition of the two membranes is not from the same source. For, if the blood vessels and nerves passed through from side to side, there would be the same inflammatory action on both sides and the same deposite on both sides, creating dental *anchylosis*—a condition never known to exist.

What united functions do the teeth and jaws serve?

Ans. The function of prehension and of mastication.

Define prehension.

Ans. The act of seizing a portion of food presented for alimentation.

What is mastication?

Ans. Crushing, grinding, pulverizing and insalivating food.

What are the movements of jaws employed in mastication?

Ans. Movement is confined to the lower maxilla, working against the upper as a fixed body. There are three varieties of movements down and up, right and left, forward and backward; there is also a combined movement.

What class of muscles furnish the power in mastication?

Ans. The temporal and buccal muscles.

What other muscles aid in mastication?

Ans. The oral and lingual muscles are necessary aids. The *orbicularis oris* closes the mouth and prevents the food from escaping, and the lingual muscles aid the buccal in keeping the food between the jaws, during the process of mastication.

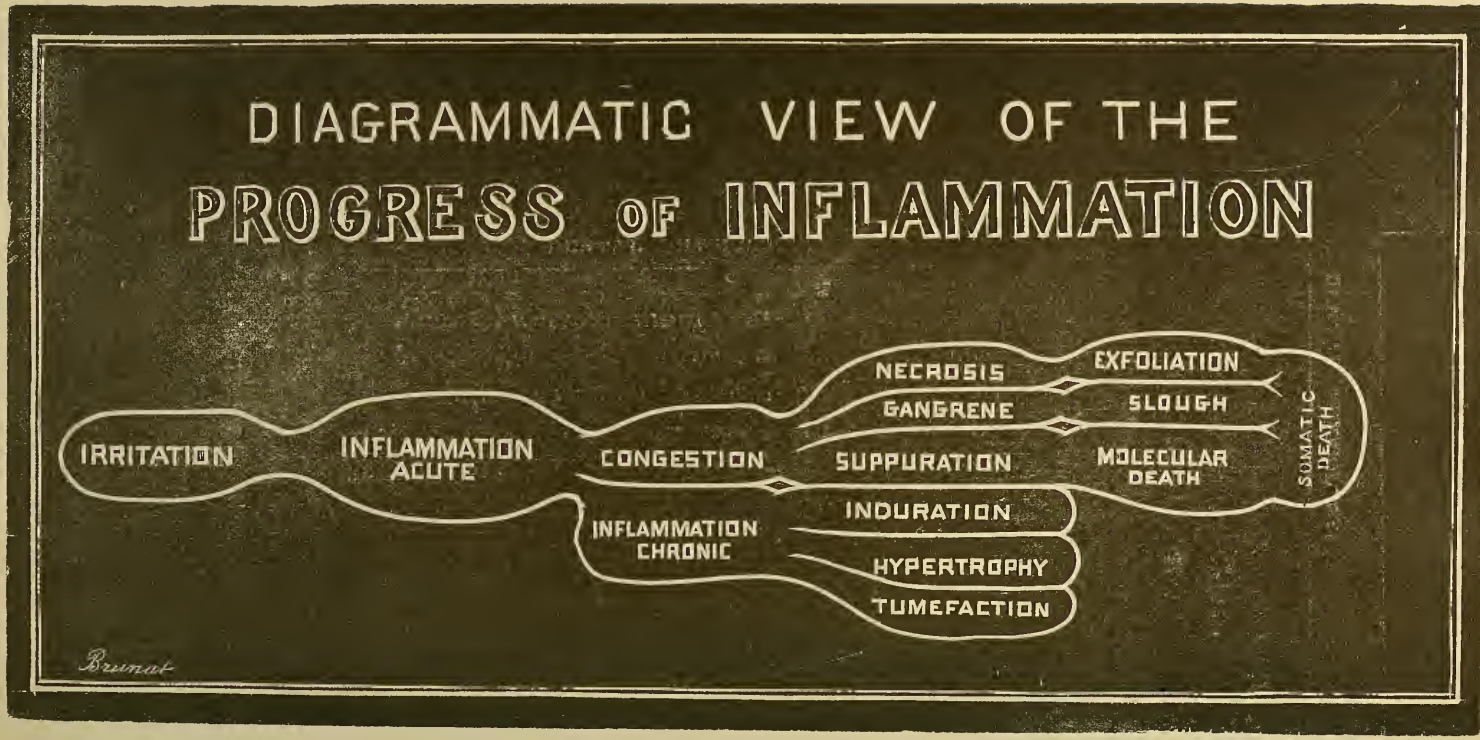
What is the purpose of insalivation?

Ans. Insalivation serves three important purposes.

1st. It softens hard food so that it can be more readily masticated.

2nd. It compacts hard and dry food into a bolus suited to deglutition.

3rd. It is an aid to digestion in the stomach.


DIAGRAMMATIC VIEW OF THE
PROGRESS OF INFLAMMATION
IRRITATION
INFLAMMATION ACUTE
CONGESTION
NECROSIS
GANGRENE
SUPPURATION
EXFOLIATION
SLOUGH
MOLECULAR DEATH
SOMATIC DEATH
INFLAMMATION CHRONIC
INDURATION
HYPERTROPHY
TUMEFACTION
Brunat

Induration
Somatic

CHAPTER III.

PATHOLOGY AND THERAPEUTICS.

[The study of Pathology has in modern times come to be, in Dentistry as in Medicine, the key to a successful practice. By far the largest number of teeth presented for a dental operation are not only in a pathological condition, but in such a pathological condition as to demand a careful investigation of disease and to require a change of conditions by therapeutical treatment, as necessary means of saving them.

Much more attention has been given by the profession to Therapeutics than to Pathology. But to study therapeutics independently of pathology is of no more use than to study the literature of a medical almanac. To treat disease by name and not by nature, is quackery. To use medicines by name and not according to their nature is also quackery. To treat disease, however simple its form, rationally and successfully, requires a knowledge of the working of disease underneath the surface and hidden from view. Disease must be treated according to its hidden nature. Pathology treats of both the visible and hidden workings of disease.

Not to know pathology is to sacrifice to the forcep hundreds of teeth annually, that might have been saved had their diseased condition been understood and rationally treated. We speak of diseased action, implying the operation of a force within the tissues; not necessarily a new force, but the normal physiological force perverted; a force tending by perverted functions to tear down what it had before built up and supported. This change of activities within the tissues is usually a fact of self-consciousness. The individual feels it sensibly, and expresses it in words with a meaning experimentally familiar to all mankind,—such as soreness, pain, inflammation, swelling and a long list of other words, equally significant, but among them none more significant or more comprehensive than the word inflammation.

Writers of reputation and authority in pathology have said that the history of any disease is but the History of the Inflammatory processes manifest in its initiation and progress.

A work on general pathological surgery could not be intelligently written without a thorough exposition of Inflammation. The same exposition is needed in dental surgery; for the same processes of diseased action are manifested in the teeth and associate parts.

Inflammation is one and the same thing every where, modified only by peculiarities of structure and intensity of action. I need therefore offer no apology for giving so large a place to the study of the inflammatory processes, without which dental pathology cannot be understood and pain cannot be interpreted. A study of the diagram, heading this chapter will make plain the teaching of the text. It is a device of my own to show by a glance of the eye out of what conditions and inflammatory processes any given development of disease has grown.

Thus tumefaction, necrosis, molecular death or any other new formation or changed condition may be traced back to its source, and all the processes contributing to its formation may be seen at once.]

Of what does pathology treat?

Ans. Of the origin and progress of those changes in the structure or functions of the body, which constitue disease.

How does dental pathology differ from general pathology?

Ans. It differs only in those modifications of disease which result from peculiarities of structure and susceptibilities of the tissue involved.

What is the literal signification of the word *pathology*.

Ans. The science of suffering, or the science which treats of the body in a condition of pain.

Is pain a necessary attendant of disease?

Ans. It is not.

What is the literal signification of the word *disease?*

Ans. Want of ease, discomfort.

Define disease *pathologically* considered.

Ans. Any abnormal condition or any functional change of those processes which constitute perfect health.

Can the beginning of disease always be recognized?

Ans. It cannot, because it may be confined to an area so small as to involve but a single cell, and *that* in an obscure portion of the body.

What word expresses the chief manifestations of diseased action?

Ans. INFLAMMATION.

Give a comprehensive definition of inflammation.

Ans. It is the aggregate of those results which manifest themselves in an injured part. (Burdon Sanderson.)

Give Stricker's definition.

Ans. "Inflammation manifests itself in two features, (1,) An active hyperæmia, and (2,) an active tissue metamorphosis."

What is the meaning of the word hyperæmia?

Ans. An excessive flow of blood to a part.

What other words are used as synonymous terms?

Ans. Fluxion, determination, inflammation.

What is understood by metamorphosis of tissue?

Ans. A change of tissue into another and different kind of tissue.

Upon what does the extent and activity of the inflammatory processes depend?

Ans. Upon the susceptibility of the part to impression by foreign influences.

What are the most commonly observed features of inflammation?

Ans. Heat, redness, pain, swelling and impaired function.

Are all these manifestations present in every case?

Ans. The manifestations vary with the character of the tissue involved, and the severity of the injury.

Is inflammation a simple condition?

Ans. It is a series of changing conditions, each the result of the preceding condition.

What is the first in the series of inflammatory conditions?

Ans. IRRITATION.

What is understood by an irritant?

Ans. The slightest foreign touch, element or influence, affecting the body to disturb the harmony and perfect performance of any of its functions.

What is the distinction between *excitants* and *irritants*?

Ans. Excitants are *normal* stimuli to the functions. Irritants are *abnormal* stimuli, causing abnormal functional action.

Under what circumstances may a normal excitant become an irritant?

Ans. Any stimulus, normal in kind, but abnormal in quantity, may become an irritant. (e. g.) Light, too intense or too feeble, irritates the eye. Food, either in too large or too small a quantity, irritates the stomach.

In what part of the anatomy is the progress of inflammation most readily traced?

Ans. In the vascular system.

What are the first observable effects of an irritant upon an exposed surface?

Ans. Increased redness and warmth.

Give the pathology of irritation?

Ans. Irritation excites the cell elements of the capillary vessels into active contractions and elongations, which has the effect to quicken the circulation of the blood and induce warmth. Warmth also expands and gives increased

length to the capillaries, so as to expose to view a greater amount of blood than is normal, thus causing an increased redness called *determination* of blood or *hyperaemia*. The expansion of the blood vessels causes slight pressure on the filaments of nerves supplying the tissue, thus causing discomfort and the attention of the mind to the affected part.

What is the result of this vascular activity?

Ans. If continued, a *permanent* dilatation of the vessels is the result.

How does this affect the flow of blood?

Ans. It retards it.

What change is indicated by the permanent dilatation of the vessels and the retardation of the blood flow.

Ans. A change from the first to the second stage of the inflammatory processes.

Why is the term *inflammation* applied specially to the second stage?

Ans. Because of the number of varying inflammatory conditions resulting directly from either its acute or chronic form.

INFLAMMATION, ACUTE.—Give the symptoms of the second stage of the inflammatory processes.

Ans. It is characterized by warmth, a sense of fullness, pressure, slight swelling and pain steadily increasing, or increasing at intervals.

What is the pathology of inflammation ?

Ans. The rapidity of the vascular action in the first stage induces warmth; the warmth expands the blood vessels; the expansion increases the volume of blood and gives the sense of fullness, pressure and the swollen condition; and the over-full blood vessels, pressing upon the filaments of nerve supplying the inflammed tissue, cause the pain, which increases with the expansion of the vessels.

Explain the therapeutical effect of heat and cold in case of acute inflammation of the dental pulp.

Ans. Cold increases the pain by contracting the vessels and suddenly checking the activity of the circulation, this creates a re-actionary pressure upon the nerves in the surrounding tissue and consequent pain. Heat expands the vessels and promotes a more free circulation, and thus relieves the pressure and the pain.

Give a diagnosis distinguishing the pain of irritation in the first stage, from the pain of acute inflammation in the second stage.

Ans. In a case of pulp *irritation* the pain will cease and all other symptoms speedily subside on removal of the irritant. In case of *acute inflammation* a removal of the irritating

cause may lessen the pain, but will not restore the pulp to its normal condition.

What is understood by *acute* and what by *chronic* inflammation?

Ans. When inflammation takes a decisive, active and painful form, running rapidly through the several processes, it is called *acute*. When from a slight injury or from a lessening of the activity of the acute manifestation, the inflammation is prolonged with lessening pain and discomfort, it is called *chronic*.

Does acute inflammation, unchecked, necessarily become chronic?

Ans. It may result in congestion or in chronic inflammation.

Inflammation, Chronic.—What is the most noticeable characteristic of chronic disease, distinguishing it from the acute form?

Ans. Its comparative painlessness.

Are prolonged continuance and diminution of pain the most important characteristics of chronic inflammation?

Ans. They are not. The most noticeable characteristic of chronic inflammation is noticed in the changed functions of the part—changes effected by time.

Upon what law of the physical organism are such changes based?

Ans. Upon the law of *functional habitude*. All the functions of the body are subject to training and adaptation to surrounding conditions. Hence, the continued irritation trains the functions of the tissues involved, to an adaptation to their changed conditions and to a less degree of susceptibility to the impression of an irritant. Thus, pain is lessened.

Give examples.

Ans. A tooth pulp exposed and suffering acute inflammation, will not tolerate contact with the atmosphere or with any solid substance; but when the inflammation becomes chronic the functions of the pulp become changed and adjusted to the abnormal environment and it will tolerate the presence of the air, saliva and food without the sense of pain. The functional habitude of the stomach and the nervous system becomes changed by the continued use of tobacco, however irritating it may at first be.

How is the chronic condition of the dental pulp affected by pressure of a foreign substance?

Ans. Slight pressure causes no pain only the sense of touch. Severe pressure, as that of mastication, becomes an irritant or an injury and causes a return of acute inflammation.

Is the pulp in its normal condition peculiarly sensitive to external influences?

Ans. It is not It may be touched by the finger or with an instrument without causing pain.

How does it become changed to the painful condition?

Ans. By inflammation.

What changes of tissue are liable to result from chronic inflammation?

Ans. Chronic inflammation of the oral tissues is liable to result in hypertrophy or in one of two forms of metamorphosed tissue, viz; Induration or tumefaction; or the chronic condition may again, by irritation, become acute and pass speedily into congestion.

HYPERTROPHY, DEFINE.—Ans. Hypertrophy is an excessive growth of normal tissue by normal functions in a state of chronic inflammation.

What is the pathological difference between hypertrophy and the inflammatory swelling of the second stage?

Ans. The swelling in the second stage of the inflammatory processes is caused by the expansion and over fullness of the blood vessels. The enlargement of hypertrophy is caused by a multiplication of the cell elements of the tissue.

What tissues of the mouth are most liable to hypertrophy?

Ans. The gum and mucous membrane.

Give the pathology of *hypertrophy*?

Ans. The irritation of the first stage induces a hyperæmic condition of the gum and a greater flow of blood than is needed in the support of normal tissue; the excess is utilized in the development of an abnormal amount of tissue of the same kind.

Name the two kinds of hypertrophy.

Ans. Physiological and pathological.

What is physiological hypertrophy?

Ans. It is an excessive nourishment and development of normal tissue by continued *excitation* and use,—e. g., the development of the muscle of a blacksmith's arm.

What is pathological hypertrophy as distinguished from the former?

Ans. It is an excessive growth of normal tissue by continued *irritation*,—i. e. normal *excitation* so excessive as to become *irritation*.

In what manner does hypertrophy of the gum manifest itself?

Ans. In the growth of long points of gum in the inter-spaces of the anterior teeth, or a thickening of the margin of the gum along the buccal faces of the bi-cuspids and molars.

What is the proper treatment of hypertrophy?

Ans. Excision. Take pointed scissors and remove the long points of gum growing in the inter-spaces of the teeth, down to the level of the gum on the labial faces of the teeth, extend the cutting with scissors or bistoury along the buccal sides of the bicuspids and molars, if needed. Then reduce the inflammation with stimulants and astringents; wood creasote and tannin are suggested as among the best. They do not combine but they act harmoniously when used together on the same pledget of cotton.

INDURATION.

How does induration manifest itself?

Ans. In a circumscribed, hardened swelling. When it pertains to the gum it presents to the touch a feeling much like bone underlying the gum. A hardened condition may manifest itself also in the buccal muscles or in the muscles of the neck, resulting from a diseased tooth.

What is the pathology of *induration*?

Ans. It is a condition of chronic inflammation in which all the functions of the diseased part are morbid and inactive; the circulation is greatly impeded; exuded lymph coagulates in the interstices of the cells; the excessive amount of blood is utilized in producing a kind of cell plethora; the individual cells be-

come enlarged and fibrillated; all the above conditions contribute to produce the hardness of the tissue.

What is the difference between hypertrophy and induration?

Ans. Both are enlargements of tissue, but in hypertrophy the enlargement is by the multiplication of cells, while in induration it is the enlargement of individual cells, and not an enlargement by cell-prolification; in hypertrophy the circulation is active; in induration it is retarded; in hypertrophy the enlarged part has a normal softness, and in induration the enlargment has an abnormal hardness.

What is the external treatment for an indurated condition of the neck and cheek?

Ans. Hot fomentations and persistent and active stimuli. Capsicum is very effective.

What is the treatment for indurated gum?

Ans. Application of extract of capsicum, severe lancing to promote suppuration, or the use of a seaton for the same purpose—the latter when other methods fail.

TUMEFACTION—Describe.

Ans. Tumefaction is a condition of chronic inflammation, by which is produced an excessive growth of abnormal tissue by the development and exercise of abnormal functions. It is

characterized in its development and growth by its independence of the rest of the body.

In what respects does tumefaction differ from hypertrophy?

Ans. Hypertrophy consists of the formation of an abnormal amount of tissue of the same kind as the surrounding tissue. Tumefaction, the formation of an abnormal amount of tissue of a *different* kind from the surrounding tissue. Hypertrophy shows no line of demarkation between the normal and abnormal tissue. Tumefaction exhibits a difference in color and in texture, and rises above the level of the surrounding tissue.

What different kinds of tumors are commonly found in the mouth and where located?

Ans. Epulis tumors, originating in the periosteum of the alveolar ridge. Cystic tumors originating, in the mucous membrane. Vascular tumors, springing from some blood-vessel supplying the gum.

Describe the appearance of each.

Epulis.—This tumefaction is usually found in the interspaces of the anterior and bi-cuspid teeth; has a deeper red color than the surrounding tissue, with a roughened, seeded or cauliflower appearance; about ragged edged roots of teeth, it is found in nodular clusters; its structure is fibrous.

Cysts of the mucous membrane are of lighter color than normal mucous tissue and glistering; They are usually filled with mucous of degenerate character. Their structure is membranous.

Vascular Tumors are of a deep red color, highly vascular, venous blood predominating; they are smooth and shining, and more or less fibrous.

Treatment.—Epulis should be treated by excision,—the bistuory entering the healthy tissue about a line from the base of the tumor, should be passed entirely around and under it, as deep in as the periosteum, so as to remove it entire.

After the removal the wound should be treated with caustic carbolic acid, thoroughly, in order to destroy the vitality of any remaining fibers.

Vascular Tumors should be removed in the same manner.

A cystic tumor should be emptied of its mucous contents by a careful puncture at the lowest point and then should be collapsed by pressure. This can usually be done by a pad of considerable size dipped in dry tannin and held firmly upon the cyst by pressure of the lips or cheek. Medicinal treatment should be confined to the external surface of the cyst and consist of the use of stimulants and astringents.

When any organ or tissue is in a state of acute inflammation, what other condition than the chronic state is liable to supervene?

Ans. CONGESTION.

What are the symptoms of congestion?

Ans. Beginning with the warmth and hyperæmia of acute inflammation, the heat pressure and pain, greatly increase. When the stage of congestion is fully reached, a severe *throbbing pain* is experienced; this, therefore, becomes a *sure*, *diagnostic sign* of congestion.

What is the pathology of congestion?

Ans. The retardation of blood-flow which begins in the second stage is continued in congestion, the current becoming slower and slower, which causes a massing together of the corpuscular elements of the blood and an engorgement of some of the capillary vessels, while others permit but a limited flow of blood through the inflamed part. This increases the pressure and the severity of the pain. With the increasing number of the capillaries that become engorged, comes the arrest of the blood-flow to such an extent as to cause almost complete *stasis*. *Blood stasis*, therefore, is the most prominent histological feature of congestion, although it does not pertain to *all* vessels.

How does the severity of the pain of congestion become intermittent?

Anastomoses

Ans. In one of two ways; 1st, By the gorges in the capillaries being broken through by the force of the blood current; or, 2nd, by the establishment of circumferential currents; the rebound of the blood which fails to pass the gorge causes a back-set of the current to the anastomoses of other vessels which the blood enters and thus passing around the inflamed area, temporarily relieves the pressure and the pain.

What is the cause of the *throbbing* pain of congestion?

Ans. A throb is experienced with each pulsation of the heart in consequence of the sudden arrest of the current of the blood by the engorgement of the capillary vessels in the inflamed part. The throb is the rebound of the blood current.

Why is the throbbing pain of a congested tooth pulp more severe than in other soft tissues?

Ans. Because the tooth pulp is confined by walls of dentine which will not admit of any expansion of the blood vessels.

What is the natural and necessary result of inflammatory stasis?

Ans. A loss of nutrition in the part where it occurs, a consequent impairment of the

vascular functions and a weakening of the walls of the vessels themselves.

If resolution does not take place at this juncture what must be the inevitable result?

Ans. The weakening of the vascular walls must continue until they become permeable; transudation of the contents of the vessels takes place and an infiltration of the same into the surrounding tissues.

What peculiarity in the structure of capillary vessels favors their easy permeability?

Ans. Their coatings being composed of cells merely glued together by their protoplasm, when their functions become impaired by the processes of inflammation, the cells are easily parted from each other.

What familiar illustration may be noticed?

Ans. The bleeding of inflamed gums, the capillary vessels parting on the slightest touch of an instrument.

What of the surgical operation of *cupping*?

Ans. Its accomplishment depends upon the easy parting of the cell elements of the capillaries.

What is inflammatory transudation and infiltration of blood into the surrounding tissues called?

Ans. Suppuration or pus-formation.

Give the pathology of pus-formation.

Ans. The permanent dilatation of the vessels and the retardation of the current of the blood, in the second stage, produce an engorgement of the capillary vessels, a massing together of the blood corpuscles and a weakening of the walls of the vessels to such a degree as to permit a transudation of liquor sanguinis. Immediately following, the white blood corpuscles which float languidly along the walls of the vessels, are excited into unusual activity, send out points or processes, which penetrate the walls of the vessels and pass through, followed by red corpuscles in smaller numbers and by dead corpuscles in blood clot and other debris of broken down tissue.

What are these cells, passing out of the blood vessels into the surrounding tissue, called?

Ans. Emigrant cells.

Are the emigrants the only pus cells?

Ans. They are not. The connective tissue cells bordering the inflamed part are excited to a rapid prolification of embryonic cells for the purposes of repair and restoration of the broken down tissue; some of these cells mingle freely with the emigrant cells, and both kinds are known as pus cells.

Is pus to be considered as dead, waste matter?

Ans. All pus is not so considered. Pus is composed of living as well as dead matter.

Is the suppurative process always and only a destructive process of inflammation?

Ans. It may be, and usually is, both destructive and reconstructive. Reconstructive agencies perpetually antagonize the destructive agencies of disease.

What is the cause of the swelling when pus forms in the body of an organ or tissue?

Ans. The exudation from the blood vessels.

How does this differ from the swelling noticed in the second stage of the inflammatory processes?

Ans. The swelling of the second stage is caused by the expansion and fullness of the blood vessels supplying the inflamed part. In the suppurative stage it is caused by transudation and infiltration of the contents of the vessels into the surrounding tissue.

What is the cause of the severe pain felt in the pus-forming processes?

Ans. The pressure of the infiltrated material and of gases formed by decomposition.

What are the symptoms of pus-formation?

Ans. A lessening of the pain, a softening of the part, fluctuation when touched by the finger,

and if the area of supperation is of large extent so as to affect the general system inducing a febrile condition, supperation may be attended with chills. If the suppurating area is limited and comparatively insignificant, no chill is experienced.

What is ulceration?

Ans. Suppuration on the *surface* of an organ or tissue.

What is abscess?

Ans. Suppuration in the *body* of a tissue.

What becomes of pus formed within the body of a tissue?

Ans. If in small amount, it may be absorbed and pass off with the general waste of the tissues and resolution may supervene. If in larger quantity, there is formed a fibrous sack to restrain the pus from infiltrating into the surrounding tissues, then a tube is formed of like tissue as the sack, leading out from the sack and opening on the surface. (*See alveolar abscess*)

What is the tube and the opening called?

Ans. The tube is called a *fistulous tube* or canal, and the opening, *a sinus.*

May ulceration be deep seated?

Ans. It may when considerable portions of tissue intervening between the suppurating

area and the external surface becomes broken down. (*See deep seated ulceration.*)

How is the work of repair accomplished?

Ans. By the embryonic cells prolificated in the surrounding healthy tissue, excited into action by the destructive agencies manifest in the inflammatory processes.

What would inevitably be the result if reconstructive agencies were not actively at work during the process of pus-formation?

Ans. Death of the inflamed organ or tissue, and possibly *somatic death.*

GANGRENE—Define?

Ans. Death of a soft tissue in a body without loss of substance.

What is the difference between death of a tissue by suppuration and death by gangrene?

Ans. The former is death of tissue particle by particle, accompanied by waste of substance, called *molecular death.* The latter is death of tissue in a body without waste of substance.

How is gangrene produced?

Ans. By a sudden cutting off of nutrition by *inflammatory stasis* in the congestive stage of the inflammatory processes.

Give examples of gangrene occuring in dental practice?

Ans. Gangrene of the gum by a careless handling of arsenious acid, and gangrene of

the pulp by the action of arsenic applied to devitalize it, and gangrene accompanying necrosis of the alveolar processes.

Does a tooth pulp die throughout its entire body at once?

Ans. It does not. It dies at the point of contact with the arsenic first; then death progresses gradually toward the parts remote.

What two theories are prevalent concerning the process of death of the pulp by arsenic?

Ans. One, that it is caused by strangulation of the blood vessels at the point of entrance to the root canal; the other, that it enters into the circulation as an irritant poison.

State objections to these theories?

Ans. If strangulation should take place the pulp would die at once, circulation being cut off from the whole body of the pulp; and in the other case, if arsenic entered into the circulation the rapidity of the circulation during inflammation would speedily accomplish the same result. Such results do not correspond with facts as to the gradual death of the pulp, requiring considerable time and proceeding gradually from the point of exposure to its apical entrance.

What is the theory taught here?

Ans. That death of the pulp is caused by *thrombosis*.

What is thrombosis?

Ans. The formation of a clot of blood within the blood vessels, increasing in extent back toward the heart, until it meets a current of blood in some anastomosing vessel, strong enough to break up the clot and remove it.

Where is this breaking up of the thrombus likely to take place?

Ans. Just outside the apical foramen.

Are the hard tissues, bone, cementum and dentine subject to the same inflammatory processes as the soft tissues?

Ans. As inflammation can pertain only to mobile, organic and vitalized matter, the inflammatory processes are not precisely the same in the hard as in the soft tissues, because the cell elements of the hard tissues are restrained in their ameboid movements by the immobility of the inorganic material to which they are intimately and mysteriously related. Furthermore, the hard tissues are nourished, not by a *circulating* fluid in rapid current, but by an interchange of fluids carried on by the slow process of *absorption*. Hence, the inflammatory processes are slow in becoming established and by their concealment are elusive of investigation.

Is enamel subject to inflammation?

Ans. Enamel having no *vital* tissue, imflammatory processes in enamel are impossible.

How does inflammation manifest itself in bone?

Ans. By pain, swelling of its organic substance, tumefaction, suppuration, molecular waste and reconstruction of tissue, necrosis and exfoliation.

To what part of the tissue do the active processes pertain?

Ans. To the periosteum covering the bone externally, to the bone corpuscles and to the medullary membrane lining the cancelli and the Haversian canals.

When nutrition of bone is arrested by the inflammatory process in what condition is the body of the bone found?

Ans. In a necrosed condition.

What is the manifestation of inflammation in cementum?

Ans. It manifests itself in the peridental membrane which forms and nourishes the cementum, and in the cell life of the lacunæ.

Does inflammation of this tissue cause pain?

Ans. Not continuous pain; but when inflamed it becomes acutely sensitive to the touch; it is seldom, if ever, recognized apart from the diseased conditions of the root membrane, except at the necks of such teeth as are denuded of that membrane.

How does inflammation manifest itself in dentine?

Ans. It is manifest in the reticulum, which unites tne terminal ends of the dentinal fibrilli and in the fibrilli themselves.

How is this changed condition of dentine designated?

Ans. It is called sensitive dentine.

When the vital portions of the cementum and the dentine are destroyed, what is dentine so affected called?

Ans. Necrosed dentine.

Can there be necrosis of the dentine while the cementum is alive?

Ans. It is scarcely possible.

Can there be necrosis of the dentine without the death of the fibrilli?

Ans. The dentine may be demineralized but not necrosed.

What is the process of softening of hard tissues by inflammation?

Ans. While the body of the hard tissue is such that it cannot swell as does soft tissue, the lacunal cells, the medullary membrane and the fibrilli of the dentine expand by inflammation at the expense of the mineral portions, thus the relative proportions of animal and mineral substance are not the same as in normal tissue.

When the suppurative process appears in bone what is it called?

Ans. *Caries* or *ulceration* of bone.

What pathological and physiological processes are manifested in *caries*?

Ans. A formation of pus covering the carious portion, a prolification of bone cells and the organization of a granular tissue.

What is the purpose of this granular tissue?

Ans. It is organized for reparation and restoration of lost tissue.

Is there any process analagous to it in the decay of dentine?

Ans. There is not; hence it should not be called "*dental caries*."

What is sloughing?

Ans. It is that process by which a portion of soft dead tissue is separated from the living tissue.

What is the slough of soft tissue called?

Ans. Sphacelus.

What is the bone thus separated called?

Ans. If in considerable body it is called, *sequestrum*; if in small fragment it is called *spiculum*, pl. *spicula*.

By what process is sloughing produced?

Ans. Sloughing is produced by two different processes; one pathological, and the other physiological.

Describe each.

Ans. The pathological, consists in a formation of pus by the breaking up of tissue along the line of contact of the living with the dead. The physiological, consists in a process of absorption of the living tissue along the line of contact, thus breaking the continuity.

Does the dead tissue of dentine ever exfoliate like other necrosed tissue?

Ans. It does not.

ÆTIOLOGY.

Of what does ætiology treat?

Ans. It treats of the causes of disease.

How are diseases classified ætiologically?

Ans. Into *idiopathic* and *symptomatic*; the former class are such as cannot be traced to any known cause; the latter, such as can be traced by symptoms or otherwise, to a cause.

Name the two divisions of causes.

Ans. *Predisposing* and *exciting*.

What is understood by a prediposing cause?

Ans. Any pre-existing bodily condition, functional habitude, peculiarity of internal structure or external form, which creates a tendency to disease, or renders favorable its development.

What are recognized as exciting causes?

Ans. Causes which immediately precede the development of disease and operate to produce it.

What is the great and well nigh universally prevalent dental disease?

Ans. The wasting of tooth substance by *decay*.

Dental Decay.

What are the most noticable features of dental decay?

Ans. 1st, A solution of enamel at a point on the tooth least exposed to friction and favorable for the retention of foreign substances.

2nd, A solution of the mineral portion of the dentine at the bottom of the concavity formed by the wasting of the enamel.

3rd, A dissolving or a crumbling out of the animal or organic portion of the dentine.

What natural causes or agencies operate to disintegrate lime formations?

Ans. All lime-rock formations and exposed bones are slowly disintegrated by atmospheric agencies alone.

By what artificial agencies may the disintegration and solution be greatly accelerated?

Ans. By acids.

Are both these agencies operative in the mouth, and from what sources?

Ans. Both are present and operative in the mouth. The atmosphere, by inhalation; and acids, produced by chemical decomposition of food remaining between or about the necks of teeth, or resulting from morbid condition of the stomach or the salivary and mucous glands.

What acid is formed in the mouth by decomposition of vegetable substances?

Ans. Acetic.

What by gastric and glandular disturbances?

Ans. Hydrochloric and lactic.

What chemical fact concerning the action of acids, favors the localized and penetrating character of the cavities formed in the teeth?

Ans. That these acids are the most active in the *nascent* state, thus wasting their strength in the immediate locality where they are generated.

The enamel having been penetrated, how is the mineral portion of dentine removed?

Ans. By the same agencies as dissolved the enamel, with the aid of the breaking up process of mineral tissue by the expansion of animal tissue when inflamed. (*See softening of bone.*)

What is the process of the destruction of the organic tissue remaining?

Ans. Organic tissue, both animal and vegetable, is destroyed by the combined action of

Nascent

three elements everywhere prevalent in nature, viz: heat, moisture and oxygen.

From what sources are these elements found in the mouth?

Ans. Heat, from the animal heat of the body; moisture, from the saliva; oxygen, from inhalation of the atmosphere; either one of the three being absent the destruction of the tissue ceases.

How is this demonstrated?

Ans. By the process of canning meats and fruits, by which the atmosphere is excluded; by the process of dessication of the same, by which moisture is excluded; and by freezing, thus practically excluding heat.

On what principle is based the practice of *filling teeth* as a prophylactic treatment of decay?

Ans. On the principle just stated—exclusion of destructive agencies.

What of the theory that micro-organisms take an active part in dental decay? State it.

Ans. That after the penetration of the enamel, by the action of acids produced chemically, bacterial germs from the atmosphere or other sources, enter the cavities and there germinate and propagate in great numbers; that they exude an acid-poison at once destructive, to a limited depth, of both the vitality of the

dentine tissue, and of the mineral elements composing it; that by crowding into the tubuli, they break down the intervening walls of the tubules; that the animal portion thus becoming freed from its combinations, is devoured by bacteria as sustenance.

Has this theory been demonstrated?

Ans. It has not. The presence of bacteria in all waste and disorganizing substances has been demonstrated; but their relations to, and the part they bear in the destructive processes of dental decay, is not known.

If the theory of their presence as an active cause of dental decay be overthrown, is there a possibility of bacteria otherwise promoting decay?

Ans. Their presence and functional activities may well be supposed to promote decay by a continued irritation, rendering it necessary in the treatment of decay to employ an effectual *germicide*.

Name some of the predisposing causes of dental decay.

Ans. Inherited type, tendency and functional action in development of the tissue; inherited taint of constitutional disease, faulty nutrition at the time of development by reason of which the relative proportions of organic and inorganic material needed for an endur-

ing structure fail to be supplied; faulty form, manifest by a rough and indented surface, prominent cusps, and deep intervening fissures on the crowns of bicuspids and molars; broad grinding surfaces in contact, and broad triangular spaces intervening at the necks of the teeth, which furnish deposits for foreign matter; and all gastric disturbances or other diseased conditions of the body that create a vitiated condition of the fluids of the mouth.

Which of these predisposing causes probably influences the development of dental decay in the largest number of cases?

Ans. Inherited idiosyncrasies. The parent is the complete *type* of the offspring, or the medium of transmitting *type* from a preceding generation to every tissue and function of the body. The teeth are not an exception.

What is *prophylaxis*?

Ans. Treatment to prevent disease.

What is the proper prophylactic treatment of dental decay?

Ans. Securing the general health of the body and absolute cleanliness of the dental organs to prevent the initiation of the disease; and the operation of *filling* to arrest its progress.

Does vitality render any resistance to the progress of decay?

Ans. If the progress of decay is slow, the waste of tissue no more rapid than by the ordinary process of mechanical abrasion, there is resistance afforded by the filling up of the dentine tubules with a calcareous formation called secondary dentine, thus increasing the density of the structure, and checking the rapidity of the progress of decay—under favorable circumstances arresting it entirely.

Diseases of the Root Membrane.

What is the ætiology?

Ans. Added to hereditary causes, a prominent *predisposing* cause in the mouths of men, is, a general hyperæmic condition of all the soft tissues of the mouth produced by the use of intoxicants and tobacco; in the mouths of women, by enfeebled nutritive functions and disordered nerves, and in both cases by want of cleanliness. The *exciting* causes are salivary calculus, decomposition of foreign matter about the necks of teeth, mechanical injuries produced by mastication, the friction of the tooth brush, wounds by a tooth pick, displacements of teeth by extraction of others, and thus producing abnormal occlusions, mercurial poison, and a very active series of inflammatory conditions caused by inflammation and death of the dental pulp.

What are the symptoms of acute inflammation of the root membrane?

Ans. Uncomfortable sensations produced by cold and warm food and drinks; tenderness to the touch; hurt on occlusion of the jaws, followed by intermittent pain; and a feeling of elongation of the tooth.

Is this feeling of elongation real, or imaginary?

Ans. Although it may at first be imaginary only, because of the acute pain on touch, it comes to be real by reason of the thickening of the root membrane by inflammation.

What is the treatment of acute inflammation of this membrane?

Ans. Capsicum and oil of cloves; the latter as a pain obtundent, and the former as a persistent stimulant. First apply the oil of cloves to the gum and about the neck of the tooth, then apply a "capsicum plaster" or a pad of the heaviest blotting paper, on one side of which the extract of capsicum is placed, and the other side gum shellac varnish,—it is far superior to iodine; a hot foot bath is also of great service.*

*It is impossible to give any definite treatment for any disease, that will apply in every case. The above is simply ONE treatment with medicines of two different classes—stimulants and pain attendents. Others of the same classes may in some cases serve the purpose as well. I can, in general, only prescribe by classes of medicines, naming one or two preferred.

Chronic Inflammation of the Root Membrane.

What are the symptoms?

Ans. Looseness, redness of the overlying gum, not sensitive to touch or to mastication of soft food, but will not bear severe pressure, and is subject to attacks of acute inflammation.

Treatment.—Same as for the acute, milder and longer continued, with a free use of astringents.

Excementosis.—Define.

Ans. It is a secondary deposit of cementum on the roots of teeth in irregular patches along the sides of the roots, or in nodular masses about the apices. *Cause:*—Chronic irritation and inflammation of the peridental membrane. (*See alveolo-dental membrane.*)

What are its symptoms?

Ans. Of an undefined neuralgic character. (*See neuralgia.*)

Alveolar Abscess.

To what specific form of disease is the term properly applied?

Ans. A diseased condition of the alveolo-dental membrane, presenting the following new formations, viz: a sack with a neck attached to the root-membrane at or near the apex of the root and containing pus; a drain-tube lead-

ing from within the sack outward and opening on the surface, through which the pus is evacuated. This is a *formed abscess.*

What are the symptoms of this condition?

Ans. An alveolar abscess may exist for years manifesting no other symptoms than a slight uneasiness and discomfort from an occasional rising and discharge of a pustule of the mucous membrane, and a slight tenderness on percussion. In other cases there is a more or less frequent recurrence of an extensive swelling of the gum attended with severe pain and a free discharge of purulent matter often called a gum-boil. In cases of extensive swelling the tooth is found very loose.

What inflammatory processes are involved in the formation of alveolar abscess?

Ans. All the successive stages from irritation to suppuration.

Give the ætiology of the disease from its inception to its full development.

Ans. The disease originates by the infiltration of septic poison through the dental foramen and into the tissue of the root membrane. This poison consists of gases and septic matter formed by the decomposition of a dead pulp, or of other matter crowded into an open root canal. The first symptom is that of acute inflammation of the root membrane, although it

is confined to a limited area immediately surrounding the apical foramen. The irritation and succeeding inflammation usually last for days, during which time there is experienced a sense of uneasiness, pressure and a slight gnawing pain. The inflamed portion of the membrane becomes thickened into a rounded mass of dense, fibrous tissue, bearing all the marks of a tumefaction. For its enlargement the alveolar bone becomes absorbed. During these active processes severe pain is experienced; the affected tooth can be distinctly identified.

The inflammatory condition manifests itself in the gum. In this condition, when chronic, it may remain for months, giving scarcely a painful symptom. This is the condition of many pulpless teeth and roots,—a tumefaction of the root membrane, an *incipient* abscess. The most gentle probing or other irritating cause may suddenly start an acute inflammation followed rapidly by congestion and suppuration and breaking down of the tumefaction. The liberated gases and pus may at first pass off through the root canal or be absorbed by the surrounding tissues, but if the inflammation is active, the clogging of the root canal and the failure of absorbtion, causes an accumulation of disorganized elements and separates the tumefied

membrane from the cementum, while the coagulable lymph which has been exuded for vital protection against the infiltrating poisons, becomes utilized in the formation of a thick, fibrous sack to restrain the pus from further infiltration into the soft tissues. The pressure of the confined pus against the alveolar walls induces absorption, which by some instinct of nature takes place at a single point only, and *that* the nearest point through which the external surface can be reached. As the perforation of the bone progresses a fibrous tube of the same tissue as the sack, is formed which passes through the bone and opens with a sinus on the gum or external skin.

What is the treatment for a fully developed abscess?

Ans. Form a free opening into the pulp chamber, pass a drop of warm water into the root canal on a few fibres of cotton, place in the mouth of the cavity a stopping of soft vul. rubber, shape a stick of hard wood to use as a piston, then force the rubber well into the pulp chamber. This will free the abscess sack of pus and expose it more freely to the action of medicines. If the apical foramen proves not to be open, free it with a fine hair broach; next use carbolic acid full strength, in the same manner as the water, forcing it

through the root and out through the sinus on the gum; follow the same treatment every three days so long as any pus is seen. If none appears after the first or second treatment, cease the caustic treatment and use wood creasote, or oil of cloves, for future treatment. A cure is indicated by a restoration of the bright pink color to the gum, the firmness of the gum tissue, a tendency to rapid healing of the sinus, and a freedom from pain on percussion.

What is the design of the caustic treatment?

Ans. The abscess sack is a new formation of the nature of a tumefaction, and needs to be destroyed; such growths, when accessible, should be excised at once, as the most rapid and successful cure. The inaccessible location of an alveolar abscess renders it more practicable to destroy it by caustics.

How soon should the opening be permanently closed by root-filling?

Ans. It is not wise to fill sooner than ten days or two weeks after the supposed cure, thus avoiding mistakes. In the mean time using mild antiseptic treatment in the canal and keeping it temporarily stopped.

May a root under any circumstances of abscess be filled immediately after the first treatment?

Ans. It may, with *some* certainty of success, provided it be of recent formation, having its first discharge of pus; but there is more certainty in less haste.

Are other remedies equally good in place of the carbolic acid?

Ans. Carbolic acid is good enough, shows best on the surface just what you have done, and makes sure work as a caustic. Creasote and tinct. of iodine, equal parts, will serve a good purpose and in some cases accomplish results where carbolic acid fails, as no *one* medicine is sure in every case.

What is the treatment of a *forming* abscess?

Ans. In its inception, prophylactic. If this fails, and resolution does not take place, use means to secure a rapid formation of pus. For prophylaxis, use a solution of iodoform, being cautious not to cause irritation about the apex, with the broach, and apply a strong capsicum plaster on the gum; alternate the dressing in the root with creasote or other anti-septic stimulant. To force the formation of abscess, moist heat applied with cloths wrung out of hot water and applied to the face; a mild dilution of capsicum applied both to the gum and face will serve a good purpose, but artificial heat is one of the most effectual means. To

relieve the pain of a forming abscess use equal parts of wine of opium and tinct. of aconite, or any other anodyne liniment.

In case it tends to dormancy without suppuration, and takes a stationary condition of incipient abscess, or a so-called "abscess without fistulous opening," what is the proper treatment?

Ans. If it persists in its dormant state make an artificial opening at the most exposed point, through the gum and through the process, and treat as an ordinary abscess. External treatment is difficult and not as apt to prove successful.

What is meant by *healing by first intention*?

Ans. Healing without loss of tissue.

What is meant by *healing by second intention*?

Ans. Healing by the formation of new tissue to replace the lost tissue. Such is called *granulation or cicatricial* tissue.*

What diseased condition about the roots of teeth is often mistaken for alveolar abscess?

[*The ancients were accustomed to deify Nature as a kind and benignant goddess, with benevolent intentions toward suffering mankind Hence, when one suffered from a wound and the goddess was appealed to, they were accustomed to say: Her first intention is to heal without any waste of tissue, and failing in this, her second intention is, to organize new tissue to repair the waste.]

Ans. DEEP SEATED ULCERATION.

How is it distinguished from abscess?

Ans. In probing an abscess through the external opening, the probe follows the fistulous canal, a fibrous soft tissue, and comes in contact with no hard tissue until it reaches the very end. In probing deep-seated ulceration through an external opening, the instrument touches some hard tissue almost immediately, either the root of the tooth or roughened bone.

What other physical distinctions are to be noticed?

Ans. An abscess has a soft-tissue membrane forming a sack, lining the pus cavity in the bone and containing the pus; ulceration in the same locality has no such lining of the pus cavity, the pus freely bathing the surface of the wasting bone and of the root. Abscess involves none of the surrounding tissues in suppurative disease. Ulceration involves all contiguous structure. An abscess voids pus through a formed tube; ulceration through one or several partings through the overlying tissues.

What is the ÆTIOLOGY of deep-seated ulceration?

Ans. It usually results from the breaking up of a chronic abscess, greatly favored in its progress if there be any scrofulous or syphalitic diathesis.

TREATMENT.—If any spicula of bone are found loose they should be removed at once. The roughened condition of the bone indicates *caries*. It should be scraped and rendered smooth, the fragments carefully removed. Then apply aromatic sulphuric acid, 50 per cent dilution. This will dissolve particles of bone still remaining, and act as a powerful antiseptic and tonic. For after-treatment, at intervals of two or three days, use solutions of chloride of zinc, sulphate of zinc, eucalyptus oil and creasote, alternately. If pus continues to form after the first application of sulph. acid repeat the application, or use *permanganate of potassa*.

PERIPYEMA, "*pyorrhoea alveolaris*," so called.

What is the best known feature of the disease?

Ans. A discharge of pus around the necks of teeth from a locality of more or less depth and extent, and immediately surrounding the affected root or roots.

What are the tissues involved?

Ans. The alveolo-dental membrane, the parietes of the alveoli and the inter-alveolar bone.

What is its ætiology?

Ans. Its ætiology rests in vague theories; that it is syphalitic,—a mercurial disease,—a catarrhal disease,—a contagion propagated by

micro-organisms,—that it is a premature senile development occasioned by general physical depravity and lack of nutrition.

What treatment is likely to prove successful?

Ans. It requires surgical, disinfectant, antiseptic, stimulating and tonic treatment. First, remove all granules of sanguinary calculus if such are found upon the roots. Scrape the careous bone, being careful not to cut or injure the *ligamentum dentium* forming the margin of the gum. Sulphuric acid is objectionable in these cases because of its rapid action upon the enamel. As a disinfectant and antiseptic, use chloride of zinc or permangamate of potassa; for tonic and astringent effect, use sulphate of zinc; for stimulating effect, use wood creasote and the essential oils; for success, use *persistence*.

DISEASES OF THE GUM.

(See *Hypertrophy* and *Tumefaction.*)

What is the cause of the most common cases of inflamed and bleeding gums?

Ans. Want of cleanliness and the accumulation of salivary and sanguinary calculi on the crowns, and about the necks of teeth just below the margin of the gums.

Treatment.—Remove all calcareous deposits and other foreign matter, and apply for three or four days successively, creasote and tannin

under the free margins of the gum and between the teeth. A mild astringent and antiseptic wash, adding an aromatic oil to make it agreeable to the taste, will be found beneficial for the use of the patient, for a limited time only.

PHAGEDENIC ULCERATION.—Describe.

Ans. This is a disease involving the gum, paries of the alveolus, and the alveolo-dental membrane in a peculiarly destructive process without the ordinary indications of inflammatory action in the surrounding tissues, wholly unlike peripyema and deep seated ulceration, and also unlike the ordinary surface ulceration. It is characterized by making progress in straight line from the margin of the gum to the apex of a tooth-root, destroying all the tissues covering the root, without any tendency to spread laterally, unless encouraged by other causes operating to inflame the gum. It is more commonly found in cleanly mouths well cared for, than in mouths neglected; it is not noticeable as a pus-forming ulceration; it is of the fungoid type; the name *phagedenic* signifies a *gnawing*, *eating* ulcer. From the margin of the gum, and leading toward the end of the root, is seen a row of beaded tumefactions or fungi, doubling upon itself as it returns from the apex of the root to the margin of the gum,

leaving a clean exposure of the root between the rows of tumefactions.

Treatment—As in case of other tumefactions, *excision* is the proper treament. With a curved bistoury enter at the margin of the gum, just within the limit of the healthy tissue, cutting entirely through to the alveolar process, and following the entire length of the diseased margin, dissect up the entire tumefied line; scrape the margins of the tooth socket, cauterize with carbolic acid, cauterize again the third day after the operation, then give occasional treatment with mild stimulants and tonics.—A strong decoction of tea recommended.

ODONTALGIA.

The term is derived from two Greek words, *odontos* and *algos*, meaning *tooth pain*, which is experienced in various localities in and about the tooth structure, and produced by a great variety of causes.

SENSITIVE DENTINE—Where found?

Ans. Chiefly on abraded masticating surfaces of the teeth, and in cavities of decay.

From what causes?

Ans. An exposure of the dental fibrils, irritation produced by friction in mastication, and decomposition of foreign matter in the cavities of decay.

What *treatment*?

Ans. When found upon the grinding surfaces of teeth apply creasote for a minute or two, then with a polished burnisher dipped in creasote burnish briskly and heavily the irritated surface, beginning rather lightly. If this does not succeed try chloride of zinc crystals, which will speedily deliquesce, in place of the creasote. If near the pulp, the chloride of zinc is objectionable. In the cavity of a tooth it is still more objectionable. If the deepest portion of the cavity can be protected, it may with safety be applied at the periphera of the dentine where will be found the most acute sensation. It causes a pain at first; excavating should begin when the pain ceases. There is no medicine less dangerous to the pulp, that will accomplish the object so fully. Iodoform, menthol, creasote, carbolic acid, aconite, are all recommended, but none are wholly satisfactory. Arsenic should never be used for this purpose.

Inflammation of the Pulp.

What is its *ætiology*, *diagnosis* and *treatment*?

Ans. 1st, Exposure of the dentine causes an irritation of the dentine fibrils indicated by an uncomfortable sensation in the use of cold and warm drinks, and pressure in mastication.

Treatment.—If irritation has been but for a day or two, immediate filling will give relief.

Do not use carbolic acid or other caustic,—only a mild antiseptic.

2nd, If the irritation continues, it extends through the fibrils to the pulp before any actual exposure of the pulp has occurred. In such a case, the uncomfortable sensation has become *pain*, from the same causes.

Treatment.—Avoid caustics; use oil of cloves phenol sodique, creasote or other stimulating antiseptic, and fill immediately with gutta-percha or other good temporary filling, It may in a few days be permanently filled.

3rd, If irritation has been continued so long that cold and warm drinks, or mastication cause a pain that *continues* for ten, fifteen, or thirty minutes, the pulp is seriously involved, and the final result becomes doubtful. In many cases antiseptic and sedative treatment followed by astringent and tonic medicines will restore the pulp to its normal condition, when, by temporary then permanent filling, or permanent capping and filling, the tooth may be saved from further trouble. In many other cases, *failure* is the result.

4th, When the pulp has become really *exposed*, having no dentine-covering over a portion of its surface, or if the dentine fibrils have suppurated and the tubules of overlying dentine are empty, such porous dentine is equiva-

lent to an exposure of the pulp. Under such circumstances it is subject to paroxysmal pains and steady yet intermittent pains. If the pulp has become involved by this slow process, causing pain at intervals for weeks, there is more certainty in extirpation than in any attempts to save it.

EXTIRPATION of the pulp.

What does it mean, and how is it accomplished?

Extirpation means devitalization and *complete riddance* of every vestige of pulp tissue, from the opening of the pulp chamber to the apical foramen. Devitalization is accomplished by the use of arsenic,—the pulverized crystals. It will cause less pain if the acute inflammation of the pulp is first reduced.

First, fully expose the pulp and locate the exposure, so that the arsenic can be applied directly upon the surface; take a ball of cotton not larger than a pin's head, moisten it with creasote and touch it to the powdered arsenic; if the cotton ball is no larger than indicated, it will take up no more arsenic than is needed. This should be carefully carried to the point of exposure, and gently pressed upon the pulp, and while the cavity is still dry, the medicament should be protected thoroughly by cotton and gum shellac, sufficient only to well fill and

dialyzed iron

protect the cavity;—other temporary stopping may be used. This may remain for from twenty-four to forty-eight hours, and if the stopping does not loosen, and it is a case from which, because of the pain of excavating, the pulp was not completely exposed, the arsenic *may* remain for a week. After its removal, and before the cavity becomes filled with saliva, apply *dialysed iron* to nutralize the arsenic and secure the surrounding tissues against harm.

Removal of the tissue is by mechanical and chemical means. It is better to wait for a day or two and until the dead tissue becomes emptied of its watery portion, and its fibrillous attachments to the dentine become broken by partial disorganization of tissue. From the straight round roots it may then be removed in a body. From the flat roots of the molars this is impossible. Decomposition is the only *sure* method of removal in such cases. If in the lower molars, *lacto-pepsin* may be employed as a digester of the fragments of pulp tissue remaining in the roots; also the carb. of soda if carefully applied. After having done all, there is no *certain* removal of dead tissue from all the molar roots except by the natural process of decomposition, and no perfectly *safe closure* of the apical foramen, until nature closes it by a deposit of cementum.

Congestion of the Pulp.

Treatment—If the throbbing pain of congestion has been experienced, extirpate at once. If quited for a season, there is the highest probability that after the best of treatment and capping, within six to eighteen months the pulp will be found dead or needing devitalization. It should be remembered that there is no organ of the body that has such a feeble hold on life as a dental pulp,—even its *vital tendencies* are toward obliteration.

Pain after Filling.

Causes. 1st, The nerve fibrils may have been in such a state of irritation when the filling was inserted that they developed an inflammation in the pulp.

2nd, The cavity of decay may have extended so near to the pulp that a metal filling would conduct thermal changes and produce pulp inflammation.

3rd, The cavity may have been free from sensation when filled, and apparently have firm walls although the pulp was in a suppurative condition.

4th, If the tooth pulp died a spontaneous death it might have been free from pain so long as the cavity was open; but when filled the diseased condition of the alveolo-dental membrane became manifest.

Bordes

5th, If the pulp was devitalized by artificial means it is more than probable that there were left in the root canals, portions of dead pulp tissue which, within six months or a year, would decompose.

Jumping Tooth Ache.

Causes.—A dying pulp, confined without vent; a suppurating pulp, half dead and half alive. Sudden decompositions and powerful expansion of gases in the closed chamber of the dental pulp cause intense pressure upon the living portion of the pulp. Cases are known of pressure of confined gas within a tooth being so great as to part the tooth asunder with an explosive sound.

Treatment.—In such cases an opening must speedily be made into the pulp chamber to allow of the escape of confined decomposing elements.

Pain by probing in the roots of teeth after devitalization of the pulp.

What is the *cause*?

Ans. Forcing the dead pulp against living and inflamed tissue about the foraminal entrance.

Pain about the necks of teeth.

Cause.—An inflammation of the cementum, arising from irritating acids formed by the decomposition of filth, often a *febrile sordes* lodged there.

Treatment.—A thorough cleaning and the application of *phenol sodique*, dilute carbolic acid and soda combined, and, in case the tooth remains very sensitive, use chloride of zinc, 10 grains to the fluid ounce of water, or the liquid of the oxi-chloride filling material.

NEURALGIA.—*True* and *false.*

Der.—*Neuron*, nerve, and *algos*, pain.

What is *true neuralgia*?

Ans. A diseased condition of the nerve tissue.

Aetiology—General debility, malarial influences, great care and anxiety of mind, overwork,—either mental or physical.

[Such patients should be sent to the family physician.]

What is false neuralgia?

Ans. *Reflex* and *sympathetic* pains.

Define each.

Ans. *Reflex* pain,—that which originates in one locality, the sensation passing back to a nerve centre, and from there reflected along the line of other nerves centering in the same ganglion.

Sympathetic pain,—that which is experienced in an organ *remote* from the local cause, but having through the *great sympathetic nerve*, more or less intimate nerve connection.

What is *facial neuralgia*?

Ans. Neuralgia affecting the FIFTH PAIR of nerves, both TRUE and FALSE.

What are the symptoms?

Ans. The pain is characterized as wandering, creeping, boring, lancinating, shooting quivering, tearing, rending, gnawing. These are characteristics more specially of true neuralgia.

Define BICUSPID PAIN.

Ans. A pain felt in the lower bicuspid teeth from a cause in other teeth, remote; either lower or upper. It is therefore neuralgia of the second class.

Give the *ætiology*.

Ans. Whenever the inferior dental nerve becomes the medium of reflected pain from any of the teeth above or below, or from any of the numerous filaments of the mental nerve distributed to the chin and lower lip, the vascular lining of the inferior dental groove becomes excited and thickened, so that at the mental foramen, located near the points of the roots of the bicuspid teeth, the nerve is constricted and pain is excited at the very point of passage through the foramen, which is referred to the *bicuspid* teeth as the cause, although they may be entirely free from disease.

What is the *treatment* of facial neuralgias?

Ans. If no local cause appears, general treatment by a physician. If, from a local cause in the dental organs, whether the neural-

gia be either *true or false*, treat first the cause, then use heat and irritating local anæsthetics, equal parts of *alcohol*, *chloroform* and *tinct.* of *aconite*; equal parts of tinct. of *capsicum* and *wine* of *opium*,—applied by moistening a ball of cotton and passing it lightly over the face, along the track of pain. If bound as a compress on the face, it is liable to vesicate, especially the former preparation.

CALCAREOUS DEPOSITS.

What two varieties of calcareous deposits are found on the teeth, and where located?

Ans. The varieties are SALIVARY and SANGUINARY. The former is located on the crowns or on any exposed surfaces of the teeth; the latter on the roots of teeth covered by the gum and other tissues.

Give the physical characteristics of each.

Ans. SALIVARY CALCULUS is, in color, from a light cream to a dark yellow, depending upon its age and the habits of the individual. Tea, coffee and tobacco deepen the color and may render it black. When first deposited it is soft enough to be removed with a tooth-brush. But in time, a few hours even, in some instances, it hardens into a kind of cement, adhering firmly to the teeth. It takes a form which is controlled by the action of the tongue and the process of mastication. It is friable

haemation

and easily broken into pieces when scaled off with an instrument.

Sanguinary Calculus is of dark color,—from a light reddish-brown to black. It exists in form of irregular crystalline granules, scattered along the root, or massed into considerable body of irregular form, about the apex, or in a line encircling the root just below the free margin of the gum. It is much harder than salivary calculus and adheres more firmly.

What are the elements composing each?

Ans. *Salivary calculus* is composed of both mineral and organic matter; about 75 per cent. of the former to 25 per cent. of the latter. The mineral elements are carbonate and phosphate of lime, and chloride and carbonate of soda. The organic matter consists of particles of food, epithelial scales, dead mucous cells and mucin; and in the mouths of smokers, an intermixture of carbon.

Sanguinary calculus is composed chiefly of lime salts colored with the hæmatin of the blood, which increases its tendency to take crystaline form.

What is the source of each?

Ans. *Salivary calculus* is deposited from the saliva; hence its name. *Sanguinary calculus* is deposited from the *liquor sanguinis* of the blood; hence its name.

Give the *aetiology* of the deposit.

Ans. Saliva is the mixed fluid from all the salivary glands and mucous follicles, and is either alkaline or neutral, when in its normal condition. On exposure in the mouth to the atmosphere and to the decomposition liable to occur, it becomes changed, and may be found either strongly acid or strongly alkaline, holding in solution lime salts. On the formation of acids in the mouth, a decomposition takes place and the lime salts held in solution in the saliva are deposited upon the teeth. Carbonic acid from the atmosphere becomes also a decomposing element, having a strong affinity for lime, it unites with the lime in salivary solution, forming *carbonate* of *lime*, which is precipitated in the same manner that lime is precipitated from "hard" water and deposited upon the walls of a pitcher or other vessel containing it. The phosphates in a similar manner.

Sanguinary calculus, being precipitated from liquor sanguinis is formed *only in connection with the suppurative process* of inflammation. The liquor sanguinis, constituting the watery portion of blood, holds in solution all the mineral elements entering into the formation of the hard tissues. When in the progress of inflammation the supperative stage is reached and liquor sanguinis is transuded, it soon de-

generates by the active decompositions and recompositions that take place in the formation of pus, and in the process, the lime salts held in solution in the liquor sanguinis, are liberated, and deposited on any hard substance within the area of suppuration. When sanguinary calcules is found encircling the roots of teeth below the free margin of the germ, it is the result of ulceration of the gum. When found within the sockets upon the sides and apical extremities of the roots, it is the result of peripyema or of deep-seated ulceration,—*not* of alveolar abscess—the calcareous deposit being found upon the surfaces most freely bathed with the pus in its most primitive condition, hence at the point of most active inflammation.

Do salivary and sanguinary calculi sustain the same relation to the ætiology of disease?

Ans. They do not. The former may be a *cause* of ulceration; the latter is a *result* of ulceration. In every case, the suppurative process must *precede* the formation of sanguinary calculus.

What conditions of the fluids of the mouth is indicated by a rapid deposit of salivary calculus?

Ans. A supersaturated alkalinity.

May any possible good be derived from the accumulation of tartar upon the teeth?

Ans. A scale of lime deposit upon the teeth may be an incidental protection against decay of the portion of the tooth covered. But it is ordinarily found covering that portion least liable to decay. Even if the decay of tooth substance should be entirely prevented by an incrustation of lime, the deposit creates an evil *far worse* than decay, by causing disease of the gum and peridental membrane, and destruction of the alveolar processes,—conditions much more difficult of treatment than decay of the dentine.

May the calcareous deposits on the crowns of teeth be removed by natural causes?

Ans. They may, by the decomposition of the organic elements, and a change of the fluids of the mouth from alkalinity to acidity.

INDEX.

	PAGE.
Absorption of Roots	60
Aconite	19
Aetiology	100
Aetiology of Decay	101
Alveolo-dental Membrane	68
Alveolar Abscess	108
Ameloblasts	47
Anæsthetics	32
Antiseptics	25
Astringents	21
Bichloride of Mercury	31
Bicuspid Pain	127
Capsicum	10
Caustics	24
Carbolic Acid	12, 25
Causes—Predisposing	100
Causes—Exciting	100
Caries of Bone	99
Cell	40
Cementum	67
Cementum, Formative Organ of	48
Chronic Inflammation of Root Membrane	108
Chloroform	36
Chloride of Zinc	29
Cleft Palate	53
Cocaine	33
Congestion	88 124
Cold and Heat	12
Creasote	25
Deciduous Teeth Follicles	48
Definitions	38
Dental Follicle	42
Dentine Organ	46
Dental Tissues Named	48

Dentine Formation - - - 54
Dentition - - - - 58
Deep-seated Ulceration - - - 115
Diagram of Inflammation - - 72
Disease - - - - 75
Diseases of Root Membrane - - 106
Disinfectants - - - - 28

Enamel Organ - - - 45
Enamel Formation - - 56
Enamel - - - - 65
Emergence of the Teeth - - 58
Epithelium, Internal - - - 57
Epithelium, External - - 57
Eptihelial Band - - - 45
Ether Sulphuric - - - 35
Escharotics - - - 24
Eucalyptus Oil - - - 28
Excementosis - - - 108
Excitants and Irritants - - 77
Extirpation of the pulp - - 122

Follicle - - - 42
Follicular Wall - - - 48
Follicles of Permanent Molars - 49
Functions of Dental Tissues - - 64

Gangrene - - - 94
Germicides - - - 28
Germ Theory - - - 103

Heat and Cold - - - 12
Healing by 1st and 2nd Intention - 114
Hypertrophy - - - 82

Induration - - - 84
Inflammation - - - 75
Inflammation, Acute - - 78
Inflammation, Chronic - - 80
Inflammation of Enamel - - 46
Inflammation of Dentine - - 98
Inflammation of Cementum - 97

Inflammation of the Pulp - - 120
Inflammation of Root Membrane - 107
Inflammation of Bone - - 97
Incipient Abscess - - 113
Insalivation - - - 71
Iodine - - - 14
Iodoform - - - - 27

Jumping Tooth-ache - - 125

Laxatives - - - - 31
Life Force - - - 39

Maxillary Bones - - - 51
Meckel's Cartilage - - 44
Medicines Classified - - - 7
Micro-Organisms - - 103
Mineralization of the Teeth - - 54
Mucous Membrane - - 42

Neuralgia—True and false - - 126

Odontoblasts - - - 47
Odontalgia - - - 119
Oil of Cloves - - - 11
Oil of Eucalyptus - - - 28
Osteoblasts - - - 47
Ossification - - - 52

Pain after Filling - - - 124
Pain by Probing Roots - - 125
Pain at the Necks of Teeth - - 125
Peripyema, (*Pyorrhœa Alveolaris*) - 116
Permanganate of Potassa - - - 29
Permanent Teeth Follicles - - 49
Peroxide of Hydrogen - - - 30
Persulphate of Iron - - 23
Permanent Teeth - - - 61
Phagedenic Ulceration - 118
Phenol-Sodique - - - 26
Physical Effects of Anæsthesia - 34

Prophylaxis - - - - 105
Pulp in Old Age - - - 55
Pulp Obliteration - - - 55
Pulp—Death by Arsenic - - 95
Pus, and Pus Formation - - - 92

Relation of Calcareous Deposits to Disease - 131
Refrigerants - - - 20
Reflex Pain - - - 126

Salivary Calculus - - 128
Sanguinary Calculus - - - 129
Salicylic Acid - - - 26
Sensitive Dentine - - - 98, 119
Sloughing - - - 99
Stimulants - - - - 9
Sulphate of Iron - - 29
Sulphate of Zinc - - - 15
Suppuration - - - - 91
Styptics - - - - 22
Sympathetic Pain - - 126

Tannin - - - - 21
"Teething" - - - 59
Teeth and Jaws - - - 70
Thrombosis - - - 95
Tumefactions - - - 85
Tonics - - - - 14
Tubular Structure of Dentine - - 54

Ulceration, Deep-Seated - - 92
Ulceration, Phagedenic - - - 118

RK57 In3

Ingersoll

COLUMBIA UNIVERSITY LIBRARIES (hsl,stx)
RK 57 In3 C.1
Dental science; questions and answers.
2002340950